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EXPERIMENT STATION RECORD

EDITORIAL

THE AGRICULTURAL DEPARTMENT APPROPRIATION ACT OF 1935

Under the provisions of the act signed by President Franklin D. Roosevelt on March 26, 1934, the Federal Department of Agriculture is granted, for expenditure mainly during the fiscal year ending June 30, 1935, a total of $60,232,007. This sum represents a decrease of $8,519,684 from the comparable appropriation as carried in the act for the previous year, but it is an increase of $2,903,303 over the aggregate of the cash withdrawals from the Treasury which were permitted following limitations on the appropriations imposed in the spring of 1933 by congressional action and special authority conferred upon the President.

Because of certain salary readjustments, the actual expenditures for both years seem likely to exceed by an indefinite amount the figures here mentioned. A major factor in the 1934 curtailments was the enlargement of the salary reductions from 8⅓ percent originally decreed to 15 percent of the individual basic salaries previously paid, and the appropriation act for 1935 was constructed on a 10-percent reduction basis. Action later taken by Congress, however, restored salaries to a 90-percent basis from February 1 to July 1, 1934, and to a 95-percent basis thereafter. This change will increase the total expenditures for 1934 and 1935 by approximately 2 and 4 percent, respectively.

Large supplementary appropriations and special funds will also be available to the Department, in part through what are known as the permanent appropriations, since their authorization is in such terms as not to require further action by Congress. Much the largest of these is covered by a provision for advances to the Agricultural Adjustment Administration which are ultimately financed by processing taxes. The estimate of the Bureau of the Budget for these advances in 1935 is $831,022,428. There is also $4,666,096 for cooperative extension work, $3,000,000 for the Federal meat inspection, a total of $2,688,500 for payments to the States and cooperative work in forestry, and $34,490 for expenses under the Cotton Standards Act. These items increase the total to over $900,000,000 for the year.

Still another important factor to be considered is the substantial allotments to the Department which have been made under P.W.A., C.W.A., and Emergency Conservation funds. On January 27, 1934, the P.W.A. allotments to the Department had aggregated $500,-975,504, of which $437,446,000 was for roads, $20,626,884 primarily for physical improvements of the Department's plant and facilities, $4,770,620 for the control of the white pine blister rust, the gipsy moth, and the black stem rust of cereals, $630,000 for the construction of plant nurseries for use in soil erosion control, $386,000 for the acquisition of lands for forest research, and the remainder for other purposes. The C.W.A. projects as of February 6, 1934, totaled $19,138,970, apportioned among several Bureaus for such purposes as the compilation of economic and meteorological data, the improvement of the national forests, and the campaigns against the cattle tick, the mosquito, and the Dutch elm disease. The Emergency Conservation funds allotted during the calendar year 1933 aggregated $86,686,104, mainly to the Forest Service. Not only did these funds augment departmental resources for the fiscal year 1934, but in some instances expenditures therefrom will be continued into the fiscal year 1935. Reference to some of these cases is made later in this discussion.

Excluding the emergency funds, what may be termed the routine annual and permanent appropriations for the Department may as usual be classified in three main categories. About 38 percent will be required for payments to the States for Federal-aid highways, forestry, the State experiment stations, and extension work. Of the remainder, approximately one half will be utilized for activities of benefit to the general public such as the Weather Bureau, meat inspection, tuberculosis eradication, the Forest Service, the Biological Survey, and the Food and Drug Administration. This leaves about $22,000,000 for those services of more direct benefit to agriculture.

Recognition is given in the act to the rapid expansion and increasing complexity of the Department's activities by the authorization of the appointment by the President of an Under Secretary of Agriculture at a compensation of $10,000 per year. Dr. Rexford G. Tugwell, Assistant Secretary of Agriculture, was nominated for this position on April 24, and confirmed by the Senate on June 14.

The unprecedented enlargement in the Department's personnel is likewise reflected in an increase from $45,000 to $63,000 in the allotment available for rent in Washington, D.C., despite the approaching completion and occupancy of a large additional sector of the Department's extensible building. On December 31, 1933, the Washington personnel of the Agricultural Adjustment Adminis-

tration numbered 3,794 and of the remainder of the Department 4,924, a total of 8,718.

The new allotments of many of the Bureaus are substantially those authorized for cash withdrawals for the previous year, although there are many important exceptions. Of those maintained with relatively little change, the Weather Bureau receives $3,032,292 as compared with $2,905,884, the increases being mainly for the general weather service and research and for aerology. The Bureau of Dairy Industry is increased from $540,000 to $559,682, the Bureau of Agricultural Engineering from $342,034 to $350,318, the Bureau of Agricultural Economics from $4,733,191 to $4,916,031, the Bureau of Biological Survey from $1,017,261 to $1,054,084, the Bureau of Home Economics from $169,338 to $178,701, the Food and Drug Administration from $1,493,000 to $1,557,713, the Grain Futures Administration from $173,179 to $181,498, and the Library from $87,551 to $87,812. The Department's quota for printing and binding is continued at $610,466, of which not to exceed $11,000 is allotted to the printing of the proceedings of the Twelfth International Veterinary Congress, which is to be held in New York City from August 13 to 18, 1934.

The allotment under the Office of Experiment Stations is $4,590,102, an increase from $4,579,670. This includes for each year payments in full to the States, Alaska, Hawaii, and Puerto Rico, of $4,388,000 under the Hatch, Adams, and Purnell Acts and supplementary legislation. This action is in accordance with Executive Order 6586 of February 6, 1934, revoking the reduction contemplated in Executive Order 6166 of June 10, 1933. The administrative funds of the Office itself are fixed at $137,125, and its funds for the maintenance of experiment stations in Hawaii and Puerto Rico at $64,977.

Payments to the States under the Smith-Lever and Capper-Ketchum Acts and supplementary legislation are also provided in full to a total of $4,072,000, but the allotment for farmers' cooperative demonstrations is reduced from $1,065,142 to $684,648. The Extension Service appropriations as a whole are $4,886,938, a reduction from $5,261,267.

The appropriations carried in the act for the Bureau of Animal Industry show a reduction from $9,192,531 to $8,802,787. The allotments for tuberculosis eradication and meat inspection are curtailed by $254,285 and $188,308, respectively, while the more significant increases include $25,136 for cattle tick eradication, $19,240 for animal husbandry investigations, and $13,325 for the enforcement of the Packers and Stockyards Act.

An increase for the Bureau of Plant Industry from $3,220,555 to $3,476,342 is apportioned among most of its projects, with the largest

beneficiaries the foreign plant introduction and the studies of forest pathology, fruit and vegetable crops and diseases, and dry-land agriculture, with increases of $81,475, $66,801, $40,428, and $14,449, respectively. The section of the act dealing with the Forest Service indicates a reduction from $8,833,855 to $8,394,323, but comparison is complicated by a supplemental appropriation for 1935 of $1,500,000 for construction of forest roads and trails and the large special allotments in 1934 from C.W.A. and Emergency Conservation funds.

The situation is somewhat similar as regards the Bureau of Entomology and Plant Quarantine, legislation for which unites under a single head the two hitherto separate Bureaus and the Division of Plant Disease Eradication and Control of the Bureau of Plant Industry. The combined appropriation for these purposes for 1935 is $3,130,536, an apparent reduction from $3,672,268, but there is a supplementary appropriation of $2,354,893 carried elsewhere in the act for grasshopper control available for both 1934 and 1935. Among the reduced allotments are those for research and control of the Japanese beetle, cereal and forage insects (mainly the European corn borer), and pink bollworm of cotton. In lieu of appropriations for the control of the gipsy and brown-tail moths, provision is made for the use in 1935 of $360,000 of a previous P.W.A. allotment for this purpose. Unexpended balances are also expected to finance the blister-rust control, and barberry eradication. The sum of $150,000 (minus future allotments from Federal relief or emergency funds) is appropriated for the control and prevention of the spread of the Dutch elm disease.

The Bureau of Chemistry and Soils is allotted $1,311,698, an apparent decrease from $1,389,305. Elsewhere in the act, however, is a supplemental appropriation of $168,326 for soil-erosion investigations, and there have been a number of P.W.A., C.W.A., and Emergency Conservation allotments. The reductions include curtailment of the funds for agricultural chemical investigations from $330,500 to $304,870, for fertilizer investigations from $265,000 to $246,071, and for the soil survey from $240,000 to $192,391.

Because of the unusual number of complicating factors the new appropriation bill is less revealing than usual as an indicator of governmental policies. It is perhaps significant, however, that while there is some shifting of emphasis and objectives, provision is made for the maintenance of the great bulk of the Department's projects without substantial change. Under the circumstances, this outcome may be construed as both an attestation of the essential soundness and value of these undertakings, and a recognition of the fact that, especially in research, stability and relative continuity of effort are wellnigh indispensable for their sucessful prosecution.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Measuring the vitamins, H. E. MUNSELL (*Med. and Prof. Woman's Jour.*, *40 (1933), No. 10, pp. 291–296*).—This contribution from the Bureau of Home Economics, U.S.D.A., describes briefly methods in general use for the quantitative determination of vitamins A, B, C, D, and G and defines the various units which have been proposed. *A list of 26 references to the literature is appended.*

The need for a standard of reference in vitamin A testing, K. H. COWARD, K. M. KEY, and B. G. E. MORGAN (*Biochem. Jour.*, *27 (1933), No. 3, pp. 873–877*).—Further evidence is given in support of the recommendation of Coward, Dyer, and Morton (E.S.R., 69, p. 630) that in vitamin A determinations a comparison should always be made with a standard of reference, the two tests being carried on simultaneously.

In 13 successive determinations of the vitamin A content of a particular sample of cod-liver oil over a total period of 17 mo., a fivefold variation in results was obtained. In attempts to find some explanation of the differences, it was shown that the variations could not be attributed to season, changes in the basal diet, variations in the weights of the rats when first given the cod-liver oil, or differences in the rate of growth during the preparatory depletion period. Calculations of the correlations between the initial weights of the rats and the abscissas of the curves of response corresponding to the increases in weight of the rats showed that the initial weight influenced to a certain degree the response of the animals. This confirms the conclusion of Sherman and Burtis (E.S.R., 60, p. 194), as determined by a different method. It is pointed out, however, that the differences in initial weight do not account entirely for the variation in results.

The destruction of vitamin A by ultraviolet rays [trans. title], A. CHEVALLIER (*Compt. Rend. Soc. Biol. [Paris]*, *112 (1933), No. 16, pp. 1681–1683, figs. 2*).—Attention is called to the conflicting results reported in the literature concerning the destruction of vitamin A by irradiation and to the lack of uniformity in technic followed. In the present series of studies a carbon arc lamp was used, operating on an alternating current of 90 v and 10 a. The material, an unsaponifiable vitamin A concentrate of 1:10,000 dilution in hexane, was placed in a 1-cm thin quartz cell in complete absence of oxygen at a distance of 36 cm from the arc. Curves are given showing the absorption of the product as determined by the method noted previously (E.S.R., 70, p. 152) before and after irradiation for 10 hr. and the value of the absorption of 3,280 a.u. as a function of the time of irradiation. The direction of the curve of destruction is thought to be determined by the fact that two factors intervene, the destruction induced by irradiation and the increase in transparency which results from this destruction.

The wave-length threshold in the ultraviolet for the destruction of the vitamin A chromogen and the absorption at 3,280 Å., R. J. NORRIS and J. R. LOOFBOUROW (*Bul. Basic Sci. Res.*, *4 (1932), No. 3–4, pp. 113–118, fig. 1*).—

"*Investigations of the effects of irradiating cod-liver oil with ultraviolet light through various long-wave-pass filters indicate that the 606 mμ color test band and the 3,280 a.u. ultraviolet absorption band are destroyed only by wave lengths shorter than about 3,350–3,400 a.u. The shapes of the curves of the color test and ultraviolet absorption band values plotted against the wave-length limits of the filters used indicate that there is probably a fairly sharp wave-length threshold at which destruction begins in each instance.*"

Fat-soluble vitamins.—XXXVII, The stability of carotene solutions, C. A. Baumann and H. Steenbock (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 561–572*).—This paper continues the series noted on page 94.

Data are reported on the stability of carotene in various edible oils and other organic solvents with and without hydroquinone as a stabilizer. Refined cottonseed oil was found to be the most satisfactory stabilizing solvent among the common edible oils. Sesame oil was equally satisfactory at 4° C., but at room temperature destruction of the pigment took place much more rapidly than in cottonseed oil. Olive, corn, wheat germ, and coconut oils were greatly inferior, and the stability of the carotene dissolved in these oils was not increased by the presence of hydroquinone. Ethyl laurate and ethyl sebacate were unsatisfactory in the absence of hydroquinone, but were equal to cottonseed oil when fortified with hydroquinone.

Further tests of the stability of carotene in cottonseed oil under various conditions showed that although only 8 percent of the pigment was destroyed after 5 months' storage at 4°, the losses at room temperature during the same period amounted to 30 percent for samples kept in the dark, 37 percent in laboratory light, and 48 percent when exposed to laboratory air and light 5 minutes daily and kept for the rest of the time at 4° in the dark. In these tests the stability was not increased by the addition of hydroquinone equivalent to 4 percent of the weight of the carotene or by passing nitrogen through the oil before stoppering the containers (test tubes 8 mm in diameter and 75 mm long). Wheat germ oil, generally considered to contain antioxidants, had little stabilizing effect.

The stability of carotene in common organic solvents was found to bear no obvious relation to the molecular structure of the solvent. It was relatively stable in ethyl and methyl alcohol and unstable in the other reagents, although with all of these solvents hydroquinone had a marked stabilizing effect. Among the esters tested ethyl acetate and ethyl succinate proved stabilizing and the others, including esters of malonic, stearic, and levulinic acids, had no stabilizing effect.

The stability of carotene in ethyl esters of fatty acids, and in liver and vegetable oils, F. G. McDonald (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 455–460, figs. 4*).—In the tests reported, solutions of 0.05 percent carotene (a mixture of the α and β form melting at about 172° C.) were prepared by warming in the various solvents to about 30° for a few minutes and stored in partially filled, tightly stoppered, brown bottles at 37°, 24°, and 5°, and similar solutions were placed in tubes which were evacuated, sealed, and stored at 37°. At the end of 1, 2, 4, and 8 weeks, samples were used for carotene determinations by diluting the solutions in benzene, making a series of sector photometer spectrograms, and calculating the quantity of carotene from the observed extinction limits of the 462 mμ carotene absorption band. The data are reported graphically.

The author concludes that "a combination of the favorable factors—absence of oxygen, low temperature, and the proper vegetable oil—constitutes the ideal condition for the storage of carotene solutions."

An attempt to confer antineuritic activity upon thymus nucleic acid, F. F. HEYROTH (*Bul. Basic Sci. Res., 4 (1932), No. 3–4, pp. 119–124*).—Essentially noted from another source (E.S.R., 69, p. 169).

On catatorulin: A new method of comparing the oxidative factor in vitamin B_1 concentrates, R. PASSMORE, R. A. PETERS, and H. M. SINCLAIR (*Biochem. Jour., 27 (1933), No. 3, pp. 842–850, figs. 3*).—The term catatorulin has been assigned to the oxidase factor in vitamin B_1 concentrates, which is thought but not definitely proved to be identical with vitamin B_1 (E.S.R., 68, p. 867). With the twofold object of proving whether or not the crystalline preparations of Kinnersley, O'Brien, and Peters (E.S.R., 70, p. 153) represent pure vitamin B_1 and whether or not vitamin B_1 and catatorulin are identical, a method was devised for comparing the co-ferment effect upon the oxygen uptake of avitaminous pigeon brains with that of different vitamin B_1 concentrates.

Crystalline vitamin B_1 specimens proved to be active sources of catatorulin, distinct effects being shown with quantities as small as 0.1γ in 3 cc solution. The parallelism between vitamin B_1 and catatorulin activity was such as to suggest "strongly that they are identical and that the method estimates vitamin B_1."

Deductions as to the chemical constitution of vitamin B_1 from the absorption spectra of B_1 concentrates, F. F. HEYROTH and J. R. LOOFBOUROW (*Bul. Basic Sci. Res., 4 (1932), No. 1–2, pp. 35–54, figs. 5*).—Essentially noted form another source (E.S.R., 69, p. 325).

Vitamin B_4: Preliminary report [trans. title], R. TSCHESCHE (*Ber. Deut. Chem. Gesell., 66 (1933), No. 4, pp. 581, 582, fig. 1*).—It is announced briefly that crystals prepared by the method described by Barnes, O'Brien, and Reader (E.S.R., 69, p. 902) for vitamin B_4 correspond in composition and chemical properties, including absorption curves, to adenine hydrochloride. The question is left open as to whether the B_4 activity is due to adenine itself or to slight impurities adsorbed on the crystals. See also a note by Bernal and Crowfoot (E.S.R., 70, p. 741).

The potentials of ascorbic acid, D. E. GREEN (*Biochem. Jour., 27 (1933), No. 4, pp. 1044–1048, fig. 1*).—This paper reports, with illustration of apparatus and a description of technic, determinations of the potentials of ascorbic acid checked by colorimetric procedure, using the indicators of the Clark series. The equilibrium potential of ascorbic acid in the natural medium of lemon juice was also determined. The study is summarized as follows:

"The potentials of ascorbic acid have been shown to be drifting and easily polarizable. The potential for a given pH is a function only of the reductant and not of the oxidant. The molar strength of reductant is likewise not a determining factor. The same potential for a given pH is reached regardless of the absolute concentration of reductant. The variation of the E_h with pH has been studied and an empirical equation assigned to express approximately the relation of the variables between pH 3 and 8. The presence of ascorbic acid in lemon juice was confirmed by potential measurements."

In attempting to explain the persistence of ascorbic acid in the reduced state in tissues and plant fluids, although it is so rapidly oxidized by atmospheric oxygen in a reversible way, three possibilities are suggested. "(1) There is present some stabilizer which cuts down the autoxidation of ascorbic acid to a negligible rate; (2) some dehydrogenase system can reduce oxidized ascorbic acid more rapidly than reduced ascorbic acid can autoxidize; and (3) the production of ascorbic acid goes on continuously at a rate comparable with the rate of irreversible oxidation. There is some evidence that the first explanation is correct."

Attention is called to certain differences in the type of irreversibility of ascorbic acid and glutathione. Although the potentials of glutathione, like those of ascorbic acid, do not depend upon the concentration of oxidant, they do, unlike ascorbic acid, depend upon the absolute concentration of reductant. The colorimetric measure of glutathione is more positive and of ascorbic acid less positive than the potentiometric measure.

The relationship between the antimony trichloride blue value of cod-liver oils and that of their unsaponifiable fractions, F. J. Dyer (*Quart. Jour. Pharm. and Pharmacol., 6 (1933), No. 3, pp. 338–346*).—Comparative data are reported on the antimony trichloride values of 39 samples of cod-liver oil and of the unsaponifiable fractions of the same oils, as prepared by the method of Smith and Hazley (E.S.R., 65, p. 501). For the particular series the blue value of the unsaponifiable fraction was 161.5 percent that of the blue value of the oil itself. The degree of correlation was such that the likelihood of the value obtained by the method of Smith and Hazley being 161.5 percent that of the value of the oil itself is estimated to be equal for oils of low or high blue value. The degree of inaccuracy that is unavoidable in using the oil instead of the unsaponifiable fraction has been calculated, and it is noted that for some purposes this may be immaterial, while for others it may matter greatly.

A new method of determining base exchange capacity of soils, A. N. Puri (*Soil Sci., 37 (1934), No. 2, pp. 105–108*).—A method is described for determining the base-exchange capacity of soils by leaching with a sodium chloride solution, displacing the exchangeable sodium as sodium hydroxide by treatment with 0.1 N barium hydroxide, and titrating the sodium in the form of its carbonate after precipitating out the excess barium hydroxide with carbon dioxide. A comparison of this method with the ammonia absorption method earlier proposed (E.S.R., 65, p. 211) indicated that the two procedures give "almost similar results for the base-exchange capacity of a number of soils examined."

The equivalent physiological acidity or basicity of American fertilizers, A. L. Mehring and A. J. Peterson (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 1, pp. 95–100, fig. 1*).—The authors of this contribution from the Bureau of Chemistry and Soils, U.S.D.A., presents calculations showing that from 1880 to 1906 the average equivalent physiological effect of mixed fertilizers on soil reaction was basic; from 1907 to 1924, slightly acid; and since then, rapidly increasing to the equivalent of 150 lb. of calcium carbonate per ton of fertilizer in 1932. The upward trend appears now to have been checked.

"The present acidity could be more than neutralized when desirable by substituting dolomite or limestone for sand in the analysis formula at very little additional cost to the consumer."

The equivalent acidity and basicity of fertilizers as determined by a newly proposed method, W. H. Pierre (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 1, pp. 101–107*).—The author subjected a method for determining the equivalent acidity and basicity of fertilizers to collaborative and other study of its adaptability to control work. The method, which consists essentially in titrating the excess either of acidic or basic elements after igniting to destroy organic matter and to volatilize nitrogenous compounds, is said to have given satisfactory agreement of results when tested by chemists of eight laboratories. Limestone added as filler in mixed fertilizers was found to be accurately evaluated, and all laboratories which were equipped with furnaces for ignition are said to have reported that the method was well adapted to routine work.

Spectrographic determination of aluminum in biological ashes, D. Tourtellotte and O. S. Rask (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 1, pp. 97–102*).—The spectrographic method of analysis was found capable of detecting the presence of 5 p.p.m. of aluminum in all of the several kinds of salts and salt mixtures on which the sensitivity of the spectrographic method was tested. It determined quantitatively, with an error of ±25 percent, concentrations of aluminum ranging from 0.5 to 1,000 p.p.m. in inorganic materials, including biological ashes.

The arc and the condensed spark methods of excitation appeared to be equally satisfactory when applied to the several salts and salt mixtures used in this investigation as aluminum-containing materials. These two methods of excitation also appeared to be of equal value for determining aluminum in certain biological ashes, but in other biological ashes, especially those containing unburned carbon, the arc method seemed the more sensitive. The presence of carbon seemed to reduce the sensitiveness of the spark method of excitation but not the sensitivity of the arc method. There was not found any noticeable relationship between the volatility of the form in which aluminum occurs in the spectral source and the sensitivity of its spectrographic detection either by the arc or the condensed spark methods of excitation. "Chemical composition of aluminum-containing salts and salt mixtures does not affect correlations between aluminum concentrations and spectral effects. That is, these correlations are independent of the composition of the aluminum-containing salts or salt mixtures.

"About one half of the C.P. labeled reagents examined contained traces of aluminum detectable by the spectrographic method."

Turbidity and color measurements.—I, A photoelectric cell arrangement for measuring small quantities of certain impurities in reagent chemicals, R. A. Osborn (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 1, pp. 135–141, figs. 5*).—The author of this contribution from the Bureau of Chemistry and Soils, U.S.D.A., describes a simple, inexpensive photo-electric cell apparatus for the quantitative determination of minute quantities of certain precipitates. Iron and lead were satisfactorily determined as their sulfides in quantities as small as 0.005 mg of iron and 0.01 mg of lead. The determination of chlorides and sulfates occasion some inconvenience, however.

A rapid and accurate photometric method for determination of lead in small quantities, B. L. Samuel and H. H. Shockey (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 1, pp. 141–146, figs. 2*).—The authors claim that "after the arsenic determination has been made one man can determine lead on 10 samples in less than one hr. The agreement between samples when known quantities of lead were run was better than 0.001 grain (0.06 mg). When regular samples of apples were repeated, in only a few cases was the variation between samples as much as 0.002 grain (0.13 mg)"; etc.

Methods for determination of lead in foods, H. J. Wichmann, C. W. Murray, M. Harris, P. A. Clifford, J. H. Loughrey, and F. A. Vorhes, Jr. (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 1, pp. 108–135, figs. 2*).—In a contribution from several of the laboratories of the U.S.D.A. Food and Drug Administration six methods for the determination of small quantities of lead, particularly in spray residues, are described in working detail. "They are presented in the order in which they were developed, and their practicability increases in about the same order."

Improved methods of utilizing the Magnolia fig, H. M. Reed (*Texas Sta. Bul. 483 (1933), pp. 20*).—Steps in the prevailing commercial method of processing Magnolia figs have been carefully examined in the laboratory with the view of possible improvement. A method of canning in light sirup adapted

for use with the Magnolia fig is presented in detail. Forty percent glucose to 60 percent cane sugar is recommended as the most satisfactory ratio for candying figs. Sulfur dioxide at a concentration of 1,000 p.p.m. was found to keep figs at the hard-ripe stage for 9 mo. Higher concentrations kept such figs for over a year. The effect of washing to remove the sulfur dioxide is discussed. Figs thus preserved, and from which the greater part of the sulfur dioxide had been removed by washing, were found to have lost color and flavor to an extent such that coloring with one of the permitted food colorants was resorted to, together with an artificial mint flavoring.

Influence of ethylene upon the ripening and fragrance of fruits [trans. title], V. M. Kozlov (*Sovet Subtrop. (Soviet Subtrop.), 4 (1932), No. 1 (11), pp. 128–135, fig. 1*).—Treatment of fruit of *Citrus sinensis* and leaves of *Rosmarinus officinalis* with ethylene increased the percentage and improved the quality of ether oils extracted from them. The physicochemical constants of the ether oils of experimental and control plant material are tabulated.—(*Courtesy Biol. Abs.*)

Color in tomato products, M. B. Matlack and C. E. Sando (*Fruit Prod. Jour. and Amer. Vinegar Indus., 13 (1933), No. 3, pp. 81, 82, 90, figs. 2; also in Canner, 77 (1933), No. 20, pp. 12, 13, fig. 1; Canning Age, 14 (1933), No. 12, pp. 481, 482, figs. 2*).—The authors found the pigment responsible for the red color in both red and purple varieties of tomatoes grown in the United States to be lycopene, as in Italian tomatoes. Seven possible causes of the browning of tomato products are suggested.

The influence of humidity and carbon dioxide upon the development of molds on bread, O. Skovholt and C. H. Bailey (*Cereal Chem., 10 (1933), No. 5, pp. 446–451*).—*Aspergillus niger*, *Rhizopus nigricans*, and *Penicillium expansum* did not develop appreciably on bread crust when its moisture content was below 25 percent and the relative humidity (28° C.) was below 87 percent. Mold growth on bread was retarded by 17 percent of carbon dioxide and prevented, during such storage, by 50 percent of carbon dioxide in the atmosphere of the storage space.—(*Courtesy Biol. Abs.*)

AGRICULTURAL METEOROLOGY

Report of the Chief of the Weather Bureau, 1932–33 (*U.S. Dept. Agr., Weather Bur. Rpt. 1933, pp. III+137, pls. 4*).—This report, like previous reports (E.S.R., 69, p. 332) gives a brief administrative review of activities of the Weather Bureau during the year, a general summary of weather conditions of each month of 1932, brief summaries of data regarding tornadoes, hail, losses from windstorms, sunshine, and excessive rainfall during the year, and detailed tabulations of data for pressure, temperature, precipitation, humidity, cloudiness, wind, and evaporation throughout the United States.

The year 1932 averaged slightly warmer than normal, although considerably cooler than the preceding year. All States east of the Rocky Mountains except Texas were above normal in temperature. Texas and the States west of the Rockies were slightly below normal. March, October, and December were the months averaging below normal. Precipitation was above normal in all States east of the Rockies except Kansas, Minnesota, Missouri, Nebraska, Ohio, Wisconsin, and South Dakota, while Florida was exactly normal. West of the Rockies, Idaho, New Mexico, Oregon, Utah, and Washington were above normal. The greatest deficiency for the year occurred in the middle Pacific district, with a total rainfall 10 in. below the annual average. January, June, August, October, and December were wetter than normal, but in no case did the excess average more than 0.7 in.

Meteorological observations, [November–December, 1933], C. I. Gunness and H. Jenkins (*Massachusetts Sta. Met. Ser. Buls. 539–540 (1933), pp. 4 each*). These are the usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

The December number contains an annual summary for 1933, which shows that the mean pressure for the year was 29.98 in.; the mean temperature 48.2° F., as compared with the normal of 47.2°, highest 98° August 1, lowest −20° December 30; total precipitation 50.33 in., as compared with the normal of 43.49 in., snowfall 63.75 in., as compared with the normal of 48.38 in.; mean cloudiness 59 percent, bright sunshine 49.4 percent; last frost in spring June 2, first in fall September 12; last snow April 26, first November 6.

Meteorological tables, D. A. Seeley (*Mich. State Bd. Agr., Ann. Rpt. Sec., 71 (1932), pp. 147–160*).—Data corresponding to those previously noted (E.S.R., 68, p. 297) are reported for the year ended June 30, 1932.

Meteorological data for certain Australian localities (*Aust. Council Sci. and Indus. Res. Pam. 42 (1933), pp. 55, pl. 1; rev. in Nature [London], 133 (1934), No. 3352, p. 134*).—This pamphlet gives in tabular form data regarding temperature, rainfall, and humidity for a large number of places in Australia and Tasmania, collected by the Commonwealth Meteorological Bureau and considered to be of value in research in soils, entomology, plant industry, animal diseases, and the like. The periods covered are as a rule not less than 15 years and in a number of cases 70 to 80 years. A map showing the meteorological divisions and station locations is included.

Meteorological observations in the open and in beech and pine growth [trans. title], H. Burger (*Mitt. Schweiz. Anst. Forstl. Versuchsw., 18 (1933), No. 1, pp. 7–54, figs. 24; Fr. abs. pp. 49–53*).—Observations on rainfall, evaporation, sunshine, and air and soil temperature in the open and in a 50-year-old growth of beech and a 40-year-old growth of pine for the period 1891–95 are recorded and interpreted.

The average annual amount of rainfall which reached the soil during this period was 896 mm in the open, 666 mm in the beech growth, and 461 mm in the pine growth. In the beech growth 82 percent of the annual rainfall reached the soil during the winter half of the year and 69 percent during the summer half. In the pine growth the respective percentages were 51 in winter and 52 in summer. The annual evaporation was 928 mm in the open, 372 mm in beech growth, and 254 mm in pine growth. Evaporation during the summer half of the year was 717 mm in the open, 276 mm in beech, and 201 mm in pine. In the winter half of the year the respective figures were 211, 96, and 53 mm. The average sunshine was 1,736 hours per year or 4.8 hours per day—1,240 hours in the summer half of the year and 496 hours in the winter half. The effect of sunshine on air and soil temperature was most pronounced in summer and least in winter. The upper layers of the soil were most affected. Variations in temperature were less extreme under tree cover than in the open. There was a marked lag of temperature changes in the soil behind those in the air.

A considerable list of references is included in the article.

Relation of Oklahoma weather and crop yield to the eleven-year sunspot cycle, C. J. Bollinger (*Bul. Amer. Met. Soc., 15 (1934), No. 1, pp. 28, 29*).—Summarizing briefly the results of his study of this subject, the author states that the combined State average summer (June, July, August) rainfall of Texas, Oklahoma, and Kansas for the period 1891–1930 "had a +0.368 correlation with the winter, spring, and summer, computed solar constant values. The average corn yield per acre for the region including Texas, Oklahoma, Kansas, and Nebraska also has a high (+0.52) correlation with sunspot values.

Droughts at the sunspot maxima and minima are reflected in the annual tree rings of pines of the Ouachita Mountains as far back as 1750. Years of low solar constant values, and consequently low vapor pressure, are characterized *by low winter and high* summer temperatures in Oklahoma and neighboring States."

Climatic years, R. J. Russell (*Geogr. Rev., 24 (1934), No. 1, pp. 92–103, figs. 2*).—Supplementing previous applications of the climatic-year concept to dry and desert conditions (E.S.R., 66, p. 809), this concept is here extended to humid climates. The author concludes that "the climatic-year concept opens up many new and fruitful possibilities in climatological research. It may be adapted for use with any type of quantitative climatic definition. Used in connection with short periods of observation it furnishes a sensitive index of climatic change, for example between one year and the next or between one small group of years and another. It offers the possibility of studying climatic cycles in terms of areal distribution."

Test of an index or measure of rainfall in relation to agriculture [trans. title], J. G. Montes (*Rev. Soc. Cubana Ingen., 26 (1934), No. 1, pp. 14–56, figs. 3*).—This article deals with the possibility of developing a numerical coefficient which expresses not only the quantity of rainfall in a given period but its effectiveness from the standpoint of agriculture. The author worked out such a coefficient and explains it in this article.

On the temperature of rain, A. K. Das (*Met. Mag. [London], 68 (1933), No. 813, pp. 209, 210*).—From a review of experimental data from various sources, the author concludes that "the temperature of rain is slightly lower than the temperature of air."

Rate of water evaporation in Texas, R. E. Karper (*Texas Sta. Bul. 484 (1933), pp. 27, figs. 2*).—This bulletin summarizes in tabular form and discusses briefly measurements of evaporation from a free water surface for a number of years at 21 different places fairly well distributed over Texas.

On the basis of the data so obtained, it is stated that "evaporation generally increases gradually from the eastern to the western part of the State. Total annual evaporation from a free water surface ranges from 45 to 55 in. in the eastern part of the State, from 55 to 65 in. in the central part, and from 65 to 75 in. in the western part, or a range of 4 to 6 ft. per annum. Rainfall, *on the other hand, varies in exactly the opposite direction,* ranging from 52.81 in. at Beaumont, in the Gulf coast region, to 13.75 in. at Balmorhea, in the Trans-Pecos region. The temperature, atmospheric humidity, wind movement, *and rainfall all have a close relationship to evaporation,* and, together with the altitude and geographical location, largely determine the extent of losses through evaporation which may be expected in any given region of the State. When conditions are highly favorable to rapid evaporation, a loss of from 0.5 to 0.75 in. of water may occur in a 24-hour period. In the eastern and southeastern parts of the State the annual rainfall is equal to or slightly more than the annual evaporation, but in the drier regions the total annual evaporation from a free water surface may amount to as much as four or five times the total rainfall for the year. Total annual loss of water through evaporation, when all available measurements are considered, averages 61.65 in. in Texas, approximately two thirds of which occurs during the six warm months, April to September, inclusive."

The problems of the desert, F. Shreve (*Sci. Mo., 38 (1934), No. 3, pp. 199–209, figs. 7*).—Referring particularly to adjustments of plant and animal life to desert conditions, especially climatic conditions, the author asserts that "two fundamental questions underlie all inquiries regarding the adjustment of life to desert conditions: How does the organism handle its water and

how do conditions of intense and prolonged illumination affect its life processes? . . . The investigation of water relations has advanced further than that of light relations, because of its greater simplicity and surer physical background." "The study of light and of solar radiation in the desert is just beginning, in spite of the fact that sunshine is the greatest and most distinctive natural resource of the desert." It is stated that arid regions "provide splendid material for effective study of meteorological processes. In them are found rapid changes in temperature of the soil, vigorous convectional movements in the air, sharply contrasting droughts and downpours, all occurring under conditions such that cause and effect can be most easily followed."

SOILS—FERTILIZERS

[Soil researches of the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 357 (1934), pp. 130–134*).—Results are given of fertilizer experiments with greenhouse soils and red pine, soil testing, lysimeter and other experiments with field and forest soils, experiments on the duration of liming effects, and a study of market garden fertilizers.

[Soil investigations of the Michigan Station], C. E. Millar (*Michigan Sta. Rpt. 1932, pp. 253–255*).—The report very briefly notes work on various methods for measurements of the physical characteristics of soils; chemical investigations on methods for determining soil deficiencies, etc.; and field experiments as to fertilizer placement and the use of fertilizers for beans, top-dressing alfalfa, and on pastures.

[Soil and fertilizer studies in South Carolina] (*South Carolina Sta. Rpt. 1933, pp. 25–31, 44, 45, 51, 52, 153–156, 182, 183, figs. 5*).—Results are reported of studies on soil acidity and the use of dolomitic limestone in fertilizer mixtures, by H. P. Cooper and W. R. Paden; machine application of fertilizers, by J. J. Skinner of the U.S.D.A. Bureau of Chemistry and Soils; arsenic toxicity in soils, by W. B. Albert; the relationship between the mineral content of the soil and the plants grown on the soil, including analyses of common vegetables, by J. H. Mitchell and W. T. Mattison; factors influencing the iodine content of plants, by Mitchell; a fertilizer ratio experiment with soybeans, the turning under of summer legumes, and green manuring and fertilizer studies in lysimeters, all by J. E. Adams; and means of preventing manganese deficiency in crops and danger from overliming truck soils, both by Cooper and W. D. Moore.

[Soil Survey Reports, 1929 Series] [*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 21, pp. 74, figs. 2, map 1; 22, pp. 48, pl. 1, figs. 2, map 1*).—These surveys were made in cooperation with the Montana Experiment Station.

No. 21. *Soil survey (reconnaissance) of the northern plains of Montana*, L. F. Gieseker et al.—This area covers 23,552,000 acres extending, between the Canadian border and the Missouri River, from the northeastern corner of the State to the foothills of the Rocky Mountains, containing for the most part smooth tabular divides separated by stream valleys.

The soils are classified according to their agricultural value as farming soils, farming-grazing soils, and grazing soils. The most extensive type mapped is that of the Scobey loams, amounting to 20.3 percent of the total area surveyed. In all 34 types, grouped into 22 series, are recorded in addition to badlands, rough broken land, and other unclassified material.

No. 22. *Soil survey of the lower Flathead Valley area, Montana*, W. DeYoung and R. C. Roberts.—The lower Flathead Valley area is described as including 300,160 acres south of Flathead Lake, of which the three main physiographic

sections are the Mission, Jocko, and Camas Valleys. Drainage is provided by the Flathead River and its tributaries.

Lonepine very fine sandy loam occupies 12.8 percent of the total area surveyed; 11.3 percent of rough mountainous land and 6.3 percent of alluvial soils were also observed. The total number of soil series was found to be 12, of types 27.

Studies on podzols and brown forest soils, I, K. LUNDBLAD (*Soil Sci., 37 (1934), No. 2, pp. 137–155, figs. 5*).—Podsol and brown forest soil types are described, with special reference to certain Swedish subtypes. An acid oxalate extraction method devised by O. Tamm[1] is described, together with some illustrative experiments. The method is considered to give a measure of the weathering and to be useful in characterizing different soil types. "It is shown that the oxalate method is very good as a means of chemically characterizing the differences in the formation of the podsols and brown forest soils. The relationship and the differences between the 'climatic' and the 'aclimatic' brown forest soils are demonstrated."

The nature of slick soil in southern Idaho, P. ISAAK (*Soil Sci., 37 (1934), No. 3, pp. 157–165*).—This contribution from the Idaho Experiment Station shows that in general chemical composition and in pH value there was little difference between the "slick spot" and adjacent normal soils examined. Both were found to have a low content of soluble salts, but the Ca:Na ratio was found to have the low value of 1.71 for slick soil, while the normal soil gave the high value of 48.40. Mechanical analysis of the soils showed that the colloidal fraction of a slick soil is about three times that of a normal soil. The amount of water necessary to produce 1 g of dry matter yield from the slick soil was found to be about three times that required by the normal soil. The low crop-producing power of the slick soil is attributed to the poor physical condition of this soil, which in turn is influenced by a relatively high exchangeable Na content.

The relation of colloid dispersion in soils to chemical changes induced by biological transformations of organic materials, J. P. CONRAD (*Soil Sci., 37 (1934), No. 3, pp. 179–201*).—The author of this contribution from the California Experiment Station studied the effects upon Fresno fine sandy loam and upon Yolo loam of incubating with these soils additions of urea and of sucrose, both with and without the previous addition of nitric acid.

The application of urea resulted in a normal nitrification in both soils, and this in turn increased the specific conductance and the concentrations both of nitrates and of cations, especially that of calcium and of magnesium in the liquid phase. "These effects are assignable to the HNO_3 produced in the nitrification of the urea."

The application of sucrose to samples of both soils in which the nitrates had previously been increased by the addition of HNO_3 caused decreases in specific conductance, in cations, and in nitrate ions, and increases in pH and colloid dispersion. These results "had their origin in the withdrawal of HNO_3 from the liquid phase by micro-organisms to produce microbial proteins. The . . . cations moved meanwhile to the exchange complex to take the places formerly occupied by the H ions."

"In the sucrose-treated soils NH_4 ions began to increase early in the incubation period. Later, especially in the Yolo soil, nitrates, basic cations, and specific conductance increased in the liquid phase, while pH and colloid dispersion in general decreased. We account for these facts by the break-down of the microbial proteins formed, and the conversion of the nitrogen first to

[1] Meddel. Statens Skogsförsöksanst. [Sweden], No. 27 (1932), pt. 1–3, pp. 1–20.

ammonium carbonate and subsequently to HNO_3—a reversal of the processes taking place early in the incubation of the sucrose."

Behavior of the Jones lime requirement determination with progressive decrease in soil acidity, W. H. METZGER (*Jour. Amer. Soc. Agron., 25 (1933), No. 12, pp. 789–796, figs. 4*).—In the investigations reported upon in this contribution from the Ohio Experiment Station, a modification of the Jones lime-requirement method (E.S.R., 32, p. 610) was applied to two series of soils, each prepared by treating an originally acid soil with increasing increments of calcium hydroxide. The decrease in lime requirement corresponding to a given treatment with lime was in all cases somewhat less than the theoretical. A value agreeing fairly well with theory was obtained, however, "if the change in Jones lime requirement was increased by the calculated amount of lime needed to change the soil from the pH value of the untreated soil in equilibrium with the calcium acetate solution to the similar pH value for the treated soil"; but the lime-requirement value was not reduced to zero until enough lime had been added to the soils studied to raise their reaction considerably above pH 7.0.

Principles covering the reclamation of alkali soils, W. P. KELLEY and S. M. BROWN (*Hilgardia [California Sta.], 8 (1934), No. 5, pp. 149–177, figs. 5*).—The development of the present views of the nature of "alkali" soils (both actually alkaline soils and soils of toxic salinity) is traced in a brief historical review; the confusion in the use of the Russian term "solonetz" is noted; and the suggestion is made that this term be restricted to soils showing both the chemical and the physical properties which have been indicated by various investigators as the characteristics of solonetz, so that "solonetz is defined as alkali soil containing replaceable (absorbed) sodium, the profile of which presents certain morphological structures."

The paper also presents a report of the results of investigations on the reclamation of two important types of alkali soil. It is shown that the application of gypsum or sulfur has produced markedly effective results on the Fresno black-alkali soil, while leaching without other treatment has been equally effective with the Imperial Valley white-alkali soil. The Fresno soil can also be reclaimed by simple leaching, but only at excessively slow rates. The Fresno soil contains much replaceable sodium (60 percent or more of the total replaceable bases), while the white-alkali soil of the Imperial Valley of California contains almost no replaceable sodium.

The important aspects of the chemistry of alkali soil as affected by treatments with gypsum and sulfur and by leaching are discussed in detail, and a method for the determination (heretofore found especially difficult) of the replaceable divalent bases collectively is outlined. It is further noted that the composition of the irrigation water is an important consideration in connection with the reclamation of alkali soils, that the accomplishment of successful reclamation depends on the maintenance of effective drainage conditions, and that "the following points should be carefully considered before proceeding to reclaim an area of alkali soil: (1) The drainage conditions, (2) the composition of the soluble salts, (3) the content of replaceable (absorbed) sodium in the soil, (4) the nature and content of the calcium minerals of the soil, (5) the composition of the available irrigation water."

Studies on tropical soil microbiology.—I, The evolution of carbon dioxide from the soil and the bacterial growth curve, A. S. CORBET (*Soil Sci., 37 (1934), No. 2, pp. 109–115, fig. 1*).—The evolution of carbon dioxide from a soil sample, under laboratory conditions and at constant temperature, was found to be expressed accurately by the relation: $y = Ft^m$, y representing the total yield of carbon dioxide after time t, while F and m are constants.

"Of these constants, *m* expresses the retardation in gas evolution due to laboratory conditions, while *F* is the yield of carbon dioxide in unit time at the beginning of the experiment. This factor *F*, therefore, has a practical significance, for it is an accurate measure of the *biological activity of the soil in situ* under thermostatic conditions such as obtain in equatorial regions. Determinations of the *F* factors of soils in temperate zones will yield results of value, provided that the experiments are carried out at some arbitrary temperature."

It is indicated that, in the laboratory determination of gas evolution from soils, the curve obtained by plotting the daily yield of carbon dioxide against the time elapsed represents the phase of decrease in the general bacterial growth curve. It is concluded that, although the evolution of carbon dioxide is proportional to the numbers of micro-organisms present when the population is increasing, during the phase of decrease only a proportion of the living organisms present are concerned in the production of carbon dioxide.

Rapid soil tests, A. W. BLAIR (*N.J. Agr., 15 (1933), No. 6, pp. 2, 3*).—A brief note indicates the use and limitations of tests designed to permit quick determinations of the fertilizer requirements of soils.

Crop yields from Illinois soil experiment fields in 1932, together with a general summary for the rotation periods ending in 1932, F. C. BAUER (*Illinois Sta. Bul. 398 (1934), pp. 481–539, figs. 2*).—This bulletin continues, by covering the 1932 results, the series previously noted (E.S.R., 68, p. 25).

Fertilizer tests on an important pasture soil type, A. B. BEAUMONT (*Massachusetts Sta. Bul. 306 (1934), pp. 12, fig. 1*).—Reporting upon an investigation of the effect of top-dressing pasture soils with chemical fertilizers, this bulletin shows the following to have been among the principal results and conclusions from the work on experimental fields of Gloucester and Cheshire soils:

On the Gloucester soil the added nutrients, except phosphorus, were found to have a cumulative effect. The net mean increase due to phosphorus was 20 lb. dry material, to potassium 343 lb., to nitrogen 556 lb., and to calcium (as limestone) 230 lb. per acre. On the Cheshire soil nitrogen was more effective than other single elements, but was not so effective as the best combination of mineral elements. Nitrogen and minerals were mutually helpful in increasing yields. Certain combinations of minerals, especially those containing limestone and (or) potassium, were effective in increasing the proportion of white clover in the vegetation. In some cases, particularly with heavy applications, the addition of phosphorus further increased the proportion of clover. In correlating phosphorus response with certain physical and chemical characteristics of soils, readily available phosphorus and the fixing capacity of the soil for phosphorus were found the important factors. Little direct relation between phosphorus response and colloidal content, organic matter, or loss on ignition was noted. "It was shown by chemical analysis that large amounts of applied phosphates were both 'positionally' and 'chemically' fixed in the pasture soils studied." Lime increased the amount of readily available phosphorus in soils treated with phosphates. There was some evidence that nitrate of soda, also, increased the availability of applied phosphates.

A previously observed toxic effect of nitrate of soda upon haircap moss (*Polytrichum commune*) was corroborated by the Gloucester soil series experiments. On both types it was observed that a small, yellowish green moss (*Funaria hygrometrica*) grew especially well on bare spots of limed soils or heavily phosphated soils.

Crop response to lime and fertilizer on muck soil, C. B. WILLIAMS, H. B. MANN, and J. L. REA, JR. (*North Carolina Sta. Bul. 292 (1934), pp. 29, figs. 6*).—

A muck soil formed largely under water from roots and other forest materials deposited approximately 4 ft. deep gave fair crops of corn for 3 yr. after drainage and clearing, then a period of crop failures attributed to changes in the soil. "The cause of this change is unknown, though the suggestion that the early favorable yields without treatment were due to ashes resulting from the burning of soil, trees, and stumps seems most reasonable."

The recent results taken as a whole are believed to indicate that lime and a complete fertilizer will be essential for best returns. "The effects of fertilizer upon the yields of corn, oats, and Irish potatoes, grown in rotation . . . [on one field, 1923–29], has been materially influenced by the turning under of soybeans and crop residues."

The influence of the pH of a culture solution on the rates of absorption of ammonium and nitrate nitrogen by the tomato plant, H. E. Clark and J. W. Shive (*Soil Sci.*, *37* (*1934*), *No. 3*, *pp. 203–225*, *figs. 3*).—At the New Jersey Experiment Stations solution culture experiments were carried out with the tomato plant with four main objects, (1) to study the relative rates of absorption of NH_4–N and NO_3–N from a culture solution in which these two forms were present in approximately equal proportions simultaneously, (2) to study the influence of the pH of this culture solution upon the rates of absorption of NH_4–N and NO_3–N by the plant, (3) to study the influence of the age of the plant upon these relative absorption rates, and (4) to note any possible relationship between these absorption rates and the concentrations of NH_4–N and NO_3–N in the plant tissues.

With plants 41 days old, "the rates of absorption of NH_4–N were higher from solutions of high pH than from solutions of low pH, the rates of absorption at pH 7 being nearly twice those at pH 4. The rates of absorption of NO_3–N were higher from solutions of low pH than from solutions of high pH, the rates of absorption at pH 7 being about one half those at pH 5, where the maximum rates occurred. At pH 4 the NH_4–N absorption rates were lower than the NO_3–N rates. At pH 7 the NH_4–N absorption rates were higher than the NO_3–N rates. The maximum rates of NH_4–N absorption were higher than the maximum rates of NO_3–N absorption in the younger plants."

With plants 52 days old the rates of absorption of NH_4–N were also "higher at pH 7 than at pH 4. The rates of absorption of NH_4–N were much lower than those of NO_3–N from the pH 4 solutions. These similarities were due to the determinative effect of the pH of the solutions on the rates of nitrogen absorption. In contrast with the results obtained with the younger plants, the rates of absorption of NO_3–N in the older plants were not so greatly influenced by the pH of the solution as they were in the younger plants. Within the range of pH values employed, the rates of absorption of NO_3–N were higher than those of NH_4–N absorption from solutions of corresponding pH. This emphasizes the influence of the age of the plants upon the relative rates of absorption of NH_4–N and NO_3–N. Within the period investigated, the rates of absorption of NH_4–N per unit of plant tissue decreased and the rates of absorption of NO_3–N increased as the plants became older."

The effect of transferring plants from solutions of one pH to those of another pH, 12 days before the absorption test, was "to retard the rates of absorption of NO_3–N, regardless of whether the transfers were made from solutions of relatively high to those of low pH values, or vice versa. Plants transferred from pH 7 solutions to pH 4 solutions or vice versa for immediate absorption tests showed that the effect of the pH on the rates of absorption of NH_4–N was immediate and decisive. Although reaction change exerted an immediate and marked disturbing influence upon the rates of NO_3–N absorption, the effect was

not so pronounced or so clearly defined as it was upon the rates of NH_4-N absorption."

Influence of eight years' successive fertilizing with concentrated potash salts and with kainit on the replaceable bases of the "Terra Roxa" soil, T. DE CAMARGO and P. C. DE MELLO (*Soil Sci., 37 (1934), No. 3, pp. 167–178, figs. 2*).—This contribution from the Agronomic Institute of the State of São Paulo, Brazil, discusses the influence of 8 years' successive fertilizing with concentrated potash salts and with kainite on the replaceable bases of Terra Roxa, described as a red soil resulting from the decomposition of augite-porphyretic rocks. A considerable increase in the capacity of the soil to adsorb bases was shown by the soils of all the experimental plats; this increase was most significant in the soils of the potassium sulfate series. Less increases appeared in the series treated with kainite, with potassium chloride, and with no potassium compound. The soil from the plats which received potassium chloride and kainite contained a higher proportion of adsorbed potassium than the soil from the sulfate series. The soil in the potassium chloride series was found more nearly saturated with bases (73.3 percent) than that in the potassium sulfate series, which contained only 48.8 percent of bases.

We may conclude, therefore, that the anion of the salt plays a very important role in the effect of potash fertilizers in our Terra Roxa soil. The sulfates contribute more than the chlorides to decrease the state of saturation of the soil."

The relation between replaceable potassium and field response to potash in Hawaiian soils, O. C. MAGISTAD (*Soil Sci., 37 (1934), No. 2, pp. 99–103, fig. 1*).—The author of this contribution from the Experiment Station of the Association of Hawaiian Pineapple Canners reports upon 14 field experiments on the use of potassic fertilizers in quantities up to 1,000 lb. per acre calculated as potash. Soils which contained over 0.5 milligram equivalent of replaceable potassium per 100 g of soil gave no yield increases with added potassic fertilizers.

Studies on readily soluble phosphate in soils.—III, The effect of phosphate treatment, H. W. LOHSE and G. N. RUHNKE (*Soil Sci., 36 (1933), No. 4, pp. 303–316*).—The potassium hydrogen sulfate solution extractant previously described by the same authors (E.S.R., 69, p. 498) was applied both to soils and to phosphatic fertilizers and other phosphates in a study of the estimation of soil phosphate requirements and of the availability of phosphatic fertilizers after application to the soil. From the results obtained "it becomes apparent that studies on the conversion of phosphates in soils should accompany extraction studies when this problem is studied for agricultural purposes. Also, where field and laboratory experiments in phosphate fertility are to be compared such conversion studies should always be carried out, and this especially where phosphate fertilizers are distributed a long time before the crops are sown or in studies with crops which absorb the bulk of their nutrients late in the growing season."

Recovery of phosphorus from prairie grasses growing on central Oklahoma soils treated with superphosphate, H. F. MURPHY (*Jour. Agr. Res. [U.S.], 47 (1933), No. 11, pp. 911–917*).—Native prairie grasses, for the most part *Andropogon scoparius*, were analyzed by the Oklahoma Experiment Station to determine their phosphorus content under various conditions of growth.

The natural phosphorus content of the prairie grass was found to be low. Yield and phosphorus content were increased by treatment of the soil with superphosphate. Nitrogen and superphosphate treatment together increased the yield more than did superphosphate alone, though not always more than when nitrogen only was applied. The increased yield produced by nitrogenous

fertilizers in addition to phosphatic fertilizers carried the same increased percentage of phosphorus as did the hay from soil which had had only the phosphatic fertilizer. Nitrogenous fertilizer alone, however, produced hay of the same low phosphorus content as did no fertilizer treatment.

The recoveries of phosphorus from the added superphosphate were very low. The indication of determinations of the 0.2 N sulfuric acid-soluble phosphate was that none of the added phosphate penetrated beyond 1 ft., and that very little of it penetrated beyond the surface 3 in.

The effect of sulfur and phosphorus on the availability of iron to pineapple and maize plants, C. P. SIDERIS and B. H. KRAUSS (*Soil Sci., 37 (1934), No. 2, pp. 85–97, figs. 2*).—The authors of this contribution from the Experiment Station of the Association of Hawaiian Pineapple Canners find that pineapple soils with a high annual rainfall are relatively very acid because of a lack of such water-soluble bases as potassium, calcium, and magnesium. This condition is brought about by the fact that most of the water-soluble minerals of these bases have been leached by rain and replaced with H ions. Pineapple plants grown in such soils were observed to respond very favorably to phosphate fertilizers, a response attributed to the slight solubility of phosphates under such conditions. It is noted that phosphates form under such conditions various relatively insoluble compounds with either iron or aluminum which release water-soluble iron and phosphorus in quantities very small but sufficient for the normal development of plants.

On the other hand, "pineapple soils with a low annual rainfall have relatively high pH values, namely, 6.0 to 7.0. Their high pH values are due to their high content of such bases as potassium, calcium, and magnesium in combination with either strong or very weak acids. They do not respond to high or moderate applications of phosphates on account of their high pH values, at which phosphates in combination with either K, Ca, or Mg are relatively soluble . . . , interfering with the solubility of the small traces of water-soluble iron which exist under such conditions. If such soils are rendered more acid with sulfur or with acid fertilizers, or are supplied with forms of slowly available iron, they stimulate plant growth very appreciably even in the presence of moderate applications of phosphates."

The biological method for detecting iron deficiency appeared to the authors to have, at least for some plants, a sensitivity greater than that of the chemical methods used. Pineapples grown in a nutrient solution containing no phosphate "made twice as much growth for the first 3 months as did the other plants with phosphorus. The plants in the nutrient solution minus phosphorus were greener than those in the solutions with phosphorus, the latter showing symptoms of chlorosis in spite of the fact that the iron content in all cases was the same."

The influence of copper sulfate on iron absorption by corn plants, L. G. WILLIS and J. R. PILAND (*Soil Sci., 37 (1934), No. 2, pp. 79–83, pl. 1*).—The authors could not improve certain unproductive North Carolina acid peat soils by liming, and an unfavorable condition caused by the liming showed itself in the form of excessive absorption of iron and lodgment of iron in the nodes. Either heavy potash applications or the addition of copper sulfate corrected this condition.

"The symptom of iron accumulation in the nodes of corn is, therefore, not specific for potash deficiency. This effect of potash is not necessarily evidence of a nutrient deficiency, nor is the beneficial influence of copper due entirely to the function of this element as a nutrient."

Inspection of commercial fertilizers, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 69 (1933), pp. 46*).—This bulletin presents the usual analyti-

cal and related data with respect to the commercial fertilizers offered for sale in Massachusetts in 1933.

"Of the total tonnage of mixed fertilizers sold, 67.94 percent was from grades recommended in 1931 by New England agronomists to meet New England conditions, and an additional 18.23 percent was from grades varying but 1 percent in one or more plant food elements from the grades thus recommended. Of the 10 grades, including the multiple strength mixtures, that have the highest tonnage (29,337 tons), all but 3 were among the New England Standard Nine. These 7 grades showed a total tonnage of 24,992."

Inspection of fertilizers, W. L. Adams and A. S. Knowles, Jr. (*Rhode Island Sta. Ann. Fert. Circ., 1933, pp. 19*).—Of 482 guaranties, the largest number thus far offered in Rhode Island, 96 percent were shown by the analyses reported to have been fulfilled, and deficiencies amounting to 0.3 percent or more were found in but 1 percent of the samples examined.

Commercial fertilizers in 1932–33, G. S. Fraps and S. E. Asbury (*Texas Sta. Bul. 487 (1933), pp. 34*).—Report is made of the usual analyses of fertilizers and fertilizer materials.

AGRICULTURAL BOTANY

The time factor in fertilization and embryo development in the sugar beet, E. Artschwager and R. C. Starrett (*Jour. Agr. Rec. [U.S.], 47 (1933), No. 11, pp. 823–843, pls. 6, figs. 8*).—This investigation is based on a study of about 3,000 sugar beet flowers collected during the month of June 1931 and 1932 at Rocky Ford, Colo. The flowers were marked at the time of anthesis, and collections were made at definite intervals. The stigma of the young beet flower is closed. It usually begins to open in midafternoon, approximately 7 hr. after anthesis, and expansion is completed within 24 to 36 hr.

The embryo sac has the normal nuclear complex. The fusion polar nucleus migrates into the caecum sometimes even before anthesis. The caecum begins to form before the flower opens, and its development is completed soon after the egg is fertilized. The ovary with its ovule and embryo sac has usually a normal structure. There have been observed the following abnormalities: Two ovules within an ovary, 2 eggs within an embryo sac, abnormal elongation of nucellar tip and inner integument, and partial or complete suppression of the embryo sac.

The pollen of a given flower is fairly uniform in size, since grains of extreme dimensions are relatively few. Pollen grains of different beet selections have a different average diameter, but their plotted measurements rarely give a bimodal curve as claimed by P. Oksijuk for his material. A great deal of pollen degenerates, but, even so, many pollen grains germinate and grow down the stylar canal into the cavity of the ovary, and as a rule more than one pollen tube reaches the embryo sac. The pollen tube generally reaches its destination in about 20 hr., but sometimes in 10 hr. or even less.

Fertilization is accomplished soon after the pollen tube reaches the embryo sac. Accompanying this process, certain dark-staining bodies (in most cases supernumerary sperms) usually flank the egg in pairs. The synergids begin to degenerate before fertilization, but the antipodals very often increase in number and do not disappear until embryo development is well under way. The fusion polar nucleus divides without undergoing a rest period. At the time of fertilization there are usually present from 4 to 6 endosperm nuclei.

The egg undergoes a rest period about equal to the time it takes the pollen tube to reach the micropyle. Two-celled embryos are found commonly 36 hr.

after anthesis, occasionally sooner. In the subsequent embryo, growth is at first very slow. Differentiation of the cotyledons is noticeable in about 6 days, or somewhat later than the appearance of cellular endosperm. The embryo is mature from 12 to 14 days after anthesis. The first divisions of the egg are transverse and result in a tetrad of superimposed cells, of which the upper three form the embryo proper, while the basal cell gives rise to the hypophysis and the suspensor.

Investigation of the swelling of seeds.—III, The respiratory quotient of swelling seeds [trans. title], E. G. PRINGSHEIM (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 19 (1933), No. 4, pp. 653–712, figs. 13*).—The author continues the work of the second contribution, giving the respiration quotient of several sorts of seeds soaked in water and on moist filter paper in air and hydrogen for different times, but nothing new is added in principle. There is an extensive discussion of the theories of respiration and the factors that affect the respiration quotient.—(*Courtesy Biol. Abs.*)

Concerning the fixation of nitrogen by germinating seeds of leguminous plants, F. S. ORCUTT, A. M. SHANNON, and P. W. WILSON (*Jour. Bact., 27 (1934), No. 1, pp. 55, 56*).—In an attempt to duplicate the work of Vita (E.S.R., 70, p. 455), no evidence was obtained of fixation of nitrogen by peas exposed to the various treatments.

The internal exposed surface of foliage leaves, F. M. TURRELL (*Science, 78 (1933), No. 2032, pp. 536, 537*).—By means of microscopic measurements and averaged values, ratios between the external area of a leaf and the internally exposed areas bordering on the intercellular spaces have been obtained. Data are given for *Syringa vulgaris, Vitis vulpina, Citrus limonia, Berberis nervosa,* and *Bryophyllum calycinum.* Succulents have a low ratio, mesomorphic sun leaves a high one, while that of xerophytes depends on exposure to sun, which increases it. Rates of transpiration and photosynthesis seem to be correlated with these internal areas.—(*Courtesy Biol. Abs.*)

Relations between various physiological phenomena in plants and coloring materials appearing in vegetative organs, III, IV [trans. title], H. KOSAKA (*Jour. Dept. Agr., Kyushu Imp. Univ., 3 (1931), No. 5, pp. 99–119; 3 (1933), No. 9, pp. 251–267*).—The preceding contributions have been noted (E.S.R., 68, p. 458).

III. *The relations between growth activity and anthocyanin formation in Abutilon avicennae.*—The amount of anthocyanin formed in the rapidly growing stem of seedlings before photosynthetic activity has begun was in inverse ratio to the increment of growth in length. A similar ratio was obtained in older seedlings, and the fact that the ratio is here less distinct, especially in the "Akaguki" plants, is associated with the photosynthetic activity in this later stage. The ratio again becomes pronounced in these older Akaguki plants when their photosynthetic activity is restricted by the removal of foliage leaves. It is concluded that anthocyanin is present in *Abutilon* in inverse ratio to the amount of transformation of nutritive materials during growth, or in direct ratio to the accumulation of nutritive materials or of the products of photosynthesis.

IV. *Relations between the presence of anthocyanin coloring material and the degree of photosynthetic activity in certain cultivated plants.*—Varieties of the following species of plants, with and without anthocyanin pigment in their leaves and stems, were used: *Perilla nankinensis, Oryza sativa, Abutilon avicennae, Datura stramonium,* and *Corchorus capsularis.* The degree of assimilation was determined by comparing the total carbohydrate content of leaves collected in the morning with that of leaves collected in the evening of a bright day. The results were as follows:

Plants which contain anthocyanin pigment in both leaves and stems (*Perilla* and *Oryza*) exhibit a higher degree of assimilation than the corresponding pigmentless varieties. This is especially true under high temperature conditions. Similar results were obtained with plants (*Abutilon* and *Datura*) which contain anthocyanin pigment in the stems and petioles, but not in the leaf blades. In this case it is assumed that the higher rate of assimilation is due not to the anthocyanin pigment but to the chromogen which occurs in the blades, and it is therefore concluded that the chromogen performs the same physiologic function as the anthocyanin. An exception to these results was encountered in the case of *C. capsularis*, in which the pigmented plants did not show a higher assimilation activity than the pigmentless ones. It is suggested that this being a tropical plant, a different relationship than that existing in the other plants examined holds between temperature and its anthocyanin pigment.—(*Courtesy Biol. Abs.*)

Metabolic interrelationship between stock and scion [trans. title], K. Silberschmidt (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 19 (1933), No. 4, pp. 729–780, figs. 4*).—Many tobacco scions were grafted on homologous stocks and on *Datura stramonium*. At different intervals after grafting the nitrogen contents of scion and stock were determined. A week after grafting nitrogen congestion occurred at the base of the scion, which was greater in heteroplastic than homoplastic scions. The rise in nitrogen in the base of the scion of heteroplastic grafts corresponded with a decrease in the nitrogen of the apical part of the stock. If the scion is placed in darkness or if sprouts develop on the stock, the nitrogen moves from the scion into the stock. The results show that the nitrogen exchange between the heteroplastic partners of a graft is reduced not only by insufficient tissue growth, but also by protein specificity of both parts of the graft. The results support D. Kostoff's theory of the influence of immunity of the scion upon heteroplastic stocks.—(*Courtesy Biol. Abs.*)

Comparison of the growth increase of plants with the course of temperature as an aid to selection by the plant breeder [trans. title], O. Konold (*Pflanzenbau, 9 (1933), No. 11, pp. 430–436*).—The growth of plants depends on internal growth factors, but it is also influenced by a multitude of external factors. Instead of the heat summation, hitherto often used in comparison of the growth of various plant species, plant growth was studied in relation to the march of temperature by computing mathematical correlation. The correlation factors of individual *Lathyrus* species were worked out.—(*Courtesy Biol. Abs.*)

Unsolved variations in the night production of CO_2 in higher plants [trans. title], P. Jaccard (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 19 (1933), No. 4, pp. 713–728*).—Plants of *Pelargonium*, *Nicotiana*, *Ficus*, *Fraxinus*, *Acer*, *Zea*, *Solanum*, *Spironema*, and *Chrysanthemum* were used. Individual potted plants were arranged so that only the leafy portions of the stems were enclosed in large bell jars. The enclosed air was kept moist, and the CO_2 content was increased artificially. Considerable and irregular variations occurred in the CO_2 production by the plants which were not directly related to the CO_2 concentration in the air or to temperature. The length of exposure to light and the assimilation intensity of the plants during the previous day were also uncorrelated factors. The variations in CO_2 production are considered to be due to "inner causes" connected with the chemistry of the cell, namely, the translocation and storage of metabolic products and the fluctuations in the amounts of these during growth.—(*Courtesy Biol. Abs.*)

The biology of the potato.—XVI, Study of the colloid structure of the potato tuber. Differences between tubers of vigorous vitality and those

lacking vitality [trans. title], H. Bechhold and F. Erbe (*Arb. Biol. Reichsanst. Land u. Forstw., 20 (1932), No. 2, pp. 111–139, figs. 12*).—The water-holding capacity of the colloidal matter in raw and cooked potatoes was determined. Raw potatoes retained more water per unit of weight for a given vapor pressure than cooked potatoes. No difference was found between tubers of good vitality and tubers of low vigor. The elasticity of pieces of tubers was determined by an elastometer. For short intervals there was no difference, but for long periods the vigorous tubers showed greater elasticity. The relative viscosity of potato juice was between 1.1 and 1.2 (water 1.0) for all tubers. Methylene blue diffused more rapidly into vigorous tubers, but when the dye was placed in an opening in the tuber there was very little difference. There was no difference in the roentgen ray diagrams.

The electrical conductivity of tubers at room temperature showed no consistent difference but averaged about $0.35.10^{-3}$ reciprocal ohm. It increased to from 20 to 25.10^{-3} reciprocal ohm when the temperature was increased to 80° C. There was a very rapid increase between 60° and 70°, the protein coagulating temperature. Juice from vigorous tubers became much darker than from tubers lacking vitality. This color intensity was correlated with the degree of vigor of the tuber. Similar discoloration occurred with copper and nickel plates but not with silver, platinum, iron, zinc, and cadmium. Potato tissue reduced methylene blue at 37°, from which the reduction-oxidation potential was calculated. Safranine was not reduced, so that no definite information was obtained. The dark coloration produced by copper plates (copper probe) gave a means of determining the degree of vitality of tubers.—(*Courtesy Biol. Abs.*)

The pneumatic system of plants, especially trees, D. T. MacDougal and E. B. Working (*Carnegie Inst. Wash. Pub. 441 (1933), pp. 87, figs. 5*).—Studies were made at intervals from 1925 to 1931 of gas composition and movements in stems of *Carnegiea gigantea*, *Juglans major*, *Parkinsonia microphylla*, *Populus macdougalii*, and *P. tremuloides* in the desert climate of the vicinity of Tucson, Ariz., and of *J. major*, *Pinus radiata*, *Quercus agrifolia*, *Salix lasiolepis*, and *Sequoia sempervirens* in the equable coastal climate of the vicinity of Carmel, Calif. The pneumatic and hydrostatic systems of a woody plant occupy interlocking and mutually displaceable positions, changes in the volume of either being almost entirely due to changes in the hydrostatic system. The pneumatic system occupies diverse regions of the bole in different species. Gas was extracted, by mercury suction, through a tap set in a bore in the tree. Radial and longitudinal streaming of gases occurs through passages not yet demonstrated anatomically. Suction equivalent to 100 mm Hg applied to the woody cylinder caused gas inflow into young stems at rates varying from 0.001 cc per square centimeter of surface hourly in *Salix* to 0.032 cc in *Juglans*. Variations in barometric pressure must result in exchanges, by streaming, between the plant's pneumatic system and the outside air. The gases of the pneumatic system varied no more than 20 mm Hg from barometric pressure. CO_2 found in trunk gases varied from 0 in *Parkinsonia* and *Populus* to 26 percent in *Quercus*, O_2 from 0 in *Populus* to 22 percent in *Parkinsonia*, N_2 from 73 percent in *Parkinsonia* to 90 percent in *Populus*. Excess CO_2 and deficient O_2 in trunks as compared with air are evidently at least partly attributable to metabolic processes. Excess of O_2 in trunks has not been satisfactorily explained.—(*Courtesy Biol. Abs.*)

The influence of external factors on sap of plants [trans. title], J. G. Heyl (*Ztschr. Wiss. Biol. Abt. E, Planta, Arch. Wiss. Bot., 20 (1933), No. 2, pp. 294–353, figs. 29*).—Previous work on the nature and cause of bleeding and related phenomena is reviewed. With the aid of a self-registering method the bleeding process in its dependence upon various external conditions was followed

in the decapitated stem of ***Sanchezia nobilis*, *Ricinus zanzibariensis*, and *Brassica oleracea*.**

In this method the pot containing the individual to be studied is set into a metal vessel which is left open or closed, as required. The sap exuding from the stem is discharged through an attached capillary tube as drops having a practically constant volume. Each drop falls in a small spoon at the end of an accurately balanced beam, which, in tripping, establishes electrical contact in a system arranged to record on a clock-driven paper roll the number of drops discharged per unit of time. Resorption of sap resulting from application of plasmolyzing agents to the roots is recorded by means of a calibrated horizontal capillary tube attached to the end of the plant stem, and for control of pressure a pump and a manometer are included in the system. The horizontal capillary contains a trapped air bubble, the movement of which is photographed by momentary illumination at 1 min. intervals on a revolving drum of bromide paper placed in the rear. In this way the amount and rate of resorption of sap are recorded.

A specially constructed toluol thermograph is used to record soil temperature. To raise the soil temperature, steam is run into the metal container, and cold water is used to lower the temperature. The narcotics used also were introduced into this container.

The bleeding process in itself and in its response to external conditions varies decidedly in different individuals. Intensity of bleeding is closely linked with soil temperature and closely parallels the variations in this factor. *Brassica* also reacts to changes in air temperature. With increasing temperature bleeding shows an optimum curve, the optimum in normal plants lying between 30° and 40° C., while the maximum is about the same as the temperature limit for life. In narcotized plants the optimum is about 10° higher. Every temperature change influences bleeding. The temperature experiments show that the living cells of the aerial portion of the stem may give off water, but there is no evidence that they contribute to bleeding under normal, constant condtions. Reactions to pressure changes in the vessels are of a purely physical nature, and nowhere is a stimulus effect apparent. Plasmolyzing agents applied to the roots may retard or suppress bleeding and at higher concentrations may cause reabsorption of exuded sap. Resorption is retarded by increase and hastened by decrease of temperature. Also hydrogen or narcotics, like ether and chloroform, retard or stop bleeding, although an increase in temperature may nullify this effect.

The experiments with narcotics definitely show that the bleeding mechanism is located in the roots and involves active excretion of water by living cells. A weak electric current may hasten bleeding, but a strong high tension current hinders the process, although this effect may be completely masked by a rise in temperature. In decapitating a plant the bleeding process and absorption of water by the roots react temporarily due to pressure changes in the vessels. Water absorption by the roots shows a jump, with change in temperature from 36° to 40°, as does also the bleeding process in narcotized plants. Daily variations in the course of the bleeding are caused by changes in temperature, and an autonomous daily periodicity is improbable. Bleeding is not a pathological process but rests on processes occurring in plants which have not been wounded. The mechanism of bleeding depends upon complicated processes which are not purely osmotic in nature.—(*Courtesy Biol. Abs.*)

Function of assimilation apparatus in trees, II [trans. title], L. A. IVANOV (L. IWANOV) and N. L. KOSSOVICH (N. KOSSOWICZ) (*Bot. Zhur. S.S.S.R.* (*Jour. Bot. U.R.S.S.*), *17* (*1932*), *No. 1*, *pp. 3–71*, *figs. 3*; *Ger. abs.*, *pp. 49, 50*).—

In direct sunlight the shaded leaves assimilate less than exposed leaves. In light of 30 percent intensity the shaded leaves assimilate equally as well as the exposed leaves. In weak light shaded leaves assimilate more than exposed leaves. With decrease in intensity of light the tolerant species assimilate better than the light-demanding species. The compensation point is reached by tolerant species at a lower intensity of light than by the light-demanding species. In general, the deciduous trees assimilate more intensively than the conifers. The species of high assimilating ability are as follows: Pine (*Pinus sylvestris*), larch (*Larix sibirica*), birch (*Betula verrucosa*), willow (*Salix fragilis*), fir (*Abies sibirica*), and basswood (*Tilia parvifolia*). The species of low assimilating ability are spruce (*Picea excelsa*), elm (*Ulmus effusa*), maple (*Acer platanoides*) and oak (*Quercus pedunculata*). The fast-growing deciduous species, namely, birch and willow, show a maximum intensity of assimilation equal to 200 mg CO_2 per hour per unit area of 50 cm^2.—(*Courtesy Biol. Abs.*)

A contribution to the knowledge of regeneration in higher plants, K. KAKESITA (*Jour. Faculty Agr. Hokkaido Imp. Univ., 35 (1933), No. 1, pp. 100, figs. 12.*)—Regeneration in isolated leaves of *Bryophyllum calycinum* and *B. crenatum* and stem cuttings of several plants is concerned with the formation or accumulation of the end or intermediary products (aldehyde, alcohol, and organic acids) of incomplete or intramolecular respiration. Such products were induced to form by placing whole plants or cuttings under anaerobic conditions. The following methods were used: Plants or cuttings immersed in warm bath at from 30° to 35° C. for 8 hr. or less, experimental material placed in hydrogen or nitrogen gas for from 48 to 72 hr. at room temperature, or plants and cuttings evacuated to 700 mm of mercury in flasks for 5 hr.

When treated by these methods both species of *Bryophyllum* regenerated roots and shoots more vigorously than control leaves. Treated stem cuttings of *Populus nigra, Pelargonium zonale, Tropaeolum majus*, and *Solanum lycopersicum* regenerated shoots more quickly than controls. *Rosa macrophylla, Syringa vulgaris*, and *Hydrangea opuloides* regenerated shoots earlier than controls, and the dry weight was greater. Callus formation also was favored by the treatments. Products assumed to be of incomplete respiration, such as acetaldehyde, ethyl alcohol, or organic acids (0.01 to 0.5 percent) injected into *Bryophyllum* leaves stimulated the regeneration of roots and shoots at the notches of leaves still attached to the mother plant. There was variation in response according to the concentration of the chemicals and the number of times they were injected into the leaves. Ordinary injection needles were employed, and care was taken not to injure the veins of the leaf. The regenerative responses, catabolic products, and acidity of isolated leaves were very similar to those of treated *Bryophyllum* leaves attached to the plant.

Since anaerobic conditions bring about accumulation of products of incomplete respiration and make attached leaves respond like isolated leaves which have these same products, the conclusion drawn is that such chemicals favor regeneration in plants. This assumption was favored by the fact that the formation of tumor-like masses of cells was accelerated on the cut surface of *Beta* roots treated with the products of anaerobic respiration.—(*Courtesy Biol. Abs.*)

A plant-wilting substance [trans. title], M. LÜDTKE and H. ACHMED (*Biochem. Ztschr., 257 (1933), No. 4-6, pp. 256-266*).—A substance has been isolated from cultures of *Fusarium vasinfectum* and *F. lycopersici* that, when used in solutions, produces wilting and inhibits or depresses the germination of seed. By means of distillation in vacuum it can be purified, and proves to be one of the primary amino compounds. It is basic but retains its capacity

to produce wilting and inhibition of growth when neutralized. It is potent with whole plants and with cuttings. It is not specific, but produces wilting regardless of the kind of plant or of its age and condition of nutrition. The substance is thermostable. It is like an amine that has been synthesized, and the synthesized amine has been found to produce effects like the one isolated from the cultures of the above-named fungi.—(*Courtesy Biol. Abs.*)

The bioelectric conditions of plants and their role in plant development, with particular reference to the potato [trans. title], A. ARLAND (*Angew. Bot., 14 (1932), No. 5, pp. 440–459, figs. 9*).—The author determined currents of injury in the potato. The measurements were made by the compensation method, using a microammeter as a null instrument. The Oswald normal calomel electrode was used, and the potential of the accumulator was controlled by means of a normal cadmium element. Measurements showed that transverse cuts were always negative to longitudinal cuts. The electromotive force increased with increasing dilution of the conducting fluid. An important requisite in obtaining adequate conditions for testing of quality and vitality variation is complete immersion of the tuber in the conducting fluid and injuring at the same place each time. Neither size nor shape can then be a factor. By use of a cork borer at the hilum a core 1 cm in diameter and 3 cm long was removed, a glass tube tightly fitted in the hole, and the tube filled with conductivity fluid containing expressed juice of the core. The tuber was immersed in a 5 percent potassium chloride solution.

Experiments in April revealed typical characteristics of the currents of injury. Degenerating seed material exhibited a strikingly low electromotive force. The crown end of the tuber showed a higher electromotive force than the hilum end. Extensive experiments are deemed needed if significant and practical conclusions regarding the strength and course of the injury currents are to be drawn.—(*Courtesy Biol. Abs.*)

The significance of the H-ion concentration and the important role of some salts of the heavy metals on spherical cell formation of Aspergillus [trans. title], T. SAKAMURA and F. YOSHIMURA (*Jour. Faculty Sci., Hokkaido Imp. Univ., Ser. V, 2 (1933), No. 4, pp. 317–331, pl. 1*).—The formation of spherical hyphal cells by *A. oryzae* and *A. niger* is due to heavy metal impurities in the salts used to prepare the culture solution. When charcoal purification of the salts is utilized, their formation is practically eliminated. Salts of copper, zinc, cadmium, or nickel aid their formation, while salts of iron, manganese, and cobalt tend to suppress their formation. High pH, by precipitation of the heavy metals as phosphate, also tends to suppress the formation of spherical cells.—(*Courtesy Biol. Abs.*)

Further studies on the dependence of carbon assimilation in young grain leaves on the potassium nutrition of experimental plants [trans. title], G. GASSNER and G. GOEZE (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 20 (1933), No. 2, pp. 391–406, figs. 4*).—Determinations of carbon assimilation were made on the first leaves of wheat and barley plants at the age of from 10 to 11 days and on rye and oats at from 9 to 10 days, under greenhouse conditions, at temperatures from 15° to 18° C. The normal potash fertilization was considered to be 5.35 mg K_2O per plant and 4.37 mg per 100 g of soil. KCl and KNO_3 gave equal results. The actual K_2O supplied ranged from 0 to 26.75 mg per plant. In all cases the lowest assimilation rates occurred in the absence of K_2O additions, increased to an optimum rate, and fell with the higher dosages of potash. The optimum for wheat was from 0.5 to 1 mg K_2O per plant, for rye from 0.5 to 11 mg, for barley from 0.5 to 2.5 mg, and for oats from 0.5 to 1.5 mg K_2O per plant.—(*Courtesy Biol. Abs.*)

Manganese an essential element for green plants, E. F. HOPKINS (*[New York] Cornell Sta. Mem. 151 (1934), pp. 40, pls. 5, figs. 4*).—Through adsorption by precipitated calcium phosphate, iron phosphate, and zinc hydroxide, "manganese may be removed from culture solutions to such an extent that it cannot be detected by the most sensitive methods known. It is shown that in solutions thus freed from manganese there is no growth of the organisms studied—two species of unicellular green algae and the common duckweed *Lemna minor*. When, however, minute amounts of manganese are added to the solutions so as to give concentrations of this element ranging from 1:5,000,000 to 1:100,000,000, normal, healthy growth takes place. Not only is there no new growth from the 'inoculum' without manganese, but death of the original cells of tissues occurs because of an insufficient supply of manganese. In the case of the duckweed, this gives rise to characteristic symptoms of manganese deficiency; in the case of the algae there is apparently an autolysis of the cells which results in a decrease in their number.

"Confirmatory evidence is given by the fact that if manganese is added to these cultures before the disintegration processes have gone too far, recovery takes place and normal growth proceeds. Recent literature concerned with the relation of manganese to the higher seed plants, in conjunction with the experiments here reported, supports the author's contention that manganese is essential for all green plants."

Forty-nine references are listed.

Accelerating seed germination with gas, C. G. DEUBER (*Amer. Gas Assoc. Mo., 15 (1933), No. 8, pp. 313–315, figs. 2*).—Black oak (*Quercus velutina*) acorns and wheat, tomato, Canada field pea, and lettuce seed were subjected to treatments with mixed and coke oven illuminating gases, ethylene, and the vapors of ethylene chlorohydrin. The most marked acceleration of germination was found with the mixed illuminating gas and ethylene treatments of black oak acorns and the ethylene treatment of lettuce seed.

Stimulative effects of gas on small trees, C. G. DEUBER (*Amer. Gas. Assoc. Mo., 15 (1933), No. 9, pp. 380–383, figs. 6*).—A series of experiments with small potted trees, chiefly red (*Quercus borealis*) and black (*Q. velutina*) oak, were subjected to illuminating gas in a variety of ways. The results indicated the following stimulation phenomena: Hastening of dormant buds into early development, epinastic growth of leaf petioles, and marked tendency of lenticels on the roots to hypertrophy or of root parenchyma cells to proliferate.

Influence of micro-organisms of the soil on the vegetation of wheat [trans. title], G. TRUFFAUT and M. LEFOUIN (*Compt. Rend. Acad. Sci. [Paris], 197 (1933), No. 15, pp. 787–789*).—The numbers of micro-organisms in a fertile soil in pots, growing wheat, were determined by the Thornton and Gray method. In two experiments very large increases were noted during the growth of the wheat crop, continuing up to the time of harvest. An increase of 71 percent occurred in the cropped soil in one case compared with an increase of 28 percent in the same soil, uncropped, for the same period. At harvest time the numbers were 30 percent greater under the wheat than in the uncropped soil. Two months after harvest the numbers decreased 49 percent, the decrease in the uncropped soil in the same period being 37 percent. Field tests gave very similar results, decreases of from 43 to 54 percent in numbers of organisms occurring in the different soils after harvesting the wheat, and the greatest decrease occurring where the wheat followed alfalfa. Soils fertilized with nitrogen were higher in micro-organisms and decreased similarly to the unfertilized after harvest.

It is concluded that root excretions increase the growth of micro-organisms in cropped soils, and that the flora of the soil plays a very important part in plant nutrition.—(*Courtesy Biol. Abs.*)

Bergey's manual of determinative bacteriology: A key for the identification of organisms of the class Schizomycetes, D. H. Bergey et al. (*Baltimore: Williams & Wilkins Co., 1934, 4. ed., pp. XVI+664*).—The fourth edition of this well-known American manual, sponsored by the Society of American Bacteriologists (E.S.R., 62, p. 821) recognizes two new genera in the tribe Bactericae, namely, *Brucella* and *Listerella*. The genus *Pfeifferella* has been combined with *Actinobacillus*. Species descriptions were amplified for *Leuconostoc*, *Propionibacterium*, *Bacterioides*, and Myxobacteriales. Descriptions of about 50 new species have been included. Several species names appearing formerly have been eliminated as synonyms for other species. The synonymy and bibliographic references have been enlarged. The spelling and endings of scientific names have been brought into harmony with the latest international rules. The order Myxobacteriales has been revised. A new introduction has been prepared for this edition.

Pecan mycorrhizas, N. C. Woodroof (*Georgia Sta. Bul. 178 (1933), pp. 26, figs. 9*).—Based on over 6 yr. of observation and collection of mycorrhizal roots from pecan orchards in various parts of Georgia and northern Florida, supported by experimental studies of pecan seedlings, a description is given of 7 different types of ectotrophic mycorrhizas, 3 of which are definitely connected with *Boletus communis*, *Russula foetans*, and *R. aeruginea*, respectively. No cases have been found of pecan trees without mycorrhizal associations. Often only 1 type occurs and persists in association with an individual tree, but more than 1 type may be found on a single root system.

The presence of the mycorrhizal fungus did not in any case appear materially to alter the shape, size, or mode of branching of the roots, but it may retard tip elongation. All types of mycorrhizas studied form a mantle about the absorptive region and over the cap of young rootlets, the hyphae penetrating 1 or 2 layers deep between the cells of the cortex but not invading the stele.

Deposits occur in the cells of pecan roots, particularly in those of the endodermis similar to those believed by other workers to be formed in response to mycorrhizal influence and assumed to have a defensive function. Since the author found similar deposits in rootlets of pecan entirely free from any mycorrhizal fungus, this interpretation is considered incorrect.

No evidence was found that deficient mycorrhizal associations were responsible for the rosette disorder in pecans, but it was found that mycorrhizal development, as well as rootlet development, was scanty under rosetted trees.

Liquid media as substrata for the culturing of isolated root tips, P. R. White (*Biol. Zentbl., 53 (1933), No. 7–8, pp. 359–364, fig. 1*).—The growth rates of isolated root tips obtained by the author using a liquid medium are compared with those of N. Malyschev obtained by using a solid medium. It is pointed out that while the author's nutrient had a total salt concentration of 0.00084 N, that used by Malyschev had a total salt concentration of N to 0.5 N. It is suggested that solid media, by adsorption, probably reduce the effective concentration of the nutrient, making possible the use of concentrations which would be detrimental in a liquid medium. Some of the advantages of liquid media are pointed out.—(*Courtesy Biol. Abs.*)

GENETICS

Proceedings of the Sixth International Congress of Genetics, Ithaca, New York, 1932. Vol. I (*Brooklyn: Brooklyn Bot. Gard., 1932, vol. 1,*

pp. VII+396+XXXIX, pl. 1, figs. 50).—This volume reports the proceedings of this congress (E.S.R., 67, p. 497), its organization, and membership, and includes the following papers: The Rise of Genetics, by T. H. Morgan (pp. 87–103); The Species Problem in Datura, by A. F. Blakeslee (pp. 104–120); Inheritance of Educability, by F. A. E. Crew (pp. 121–134); Mendelism in Man, by C. B. Davenport (pp. 135–140); The Present Status of Maize Genetics, by R. A. Emerson (pp. 141–152); The Conjugation of the Chromosomes, by H. Federley (pp. 153–164); The Evolutionary Modification of Genetic Phenomena, by R. A. Fisher (pp. 165–172); Genetics of the Geographic Variation [trans. title], by R. Goldschmidt (pp. 173–184); Can Evolution be Explained in Terms of Known Genetical Facts? by J. B. S. Haldane (pp. 185–189); On the Potency of Mutant Genes and Wild-Type Allelomorphs, by O. L. Mohr (pp. 190–212); Further Studies on the Nature and Causes of Gene Mutations, by H. J. Muller (pp. 213–255); The Cytological Mechanism for Crossing Over, by K. Sax (pp. 256–273); On the Genetic Nature of Induced Mutations in Plants, by L. J. Stadler (pp. 274–294); Recent Results on the Genetics and Cytology of Crossing Over [trans. title], by C. Stern (pp. 295–303); The Use of Mosaics in the Study of the Developmental Effects of Genes, by A. H. Sturtevant (pp. 304–307); Mutations of the Gene in Different Directions, by N. W. Timoféeff-Ressovsky (pp. 308–330); The Process of Evolution in Cultivated Plants, by N. I. Vavilov (pp. 331–342); The Nature of Sex Chromosomes, by Ö. Winge (pp. 343–355); and The Roles of Mutation, Inbreeding, Crossbreeding and Selection in Evolution, by S. Wright (pp. 356–366).

The appendix contains an index to both volumes, descriptions of exhibits, and the following condensed articles received too late for inclusion in volume 2 (E.S.R., 68, p. 745): Autopolyploidism, by C. Artom (pp. 369, 370); Hybrids of *Aegilops* and *Triticum*, by M. L. Blaringhem (p. 370); Hereditary Anomalies in Mice Descending from Stock Raised (1921) by Little and Bagg, by K. E. H. Bonnevie (pp. 370–372); The Morphological Expression of Dioeciousness in the Grape, by M. J. Dorsey (pp. 372, 373); Heredity in Guinea Fowls, by A. Ghigi (pp. 373–377); Inheritance of Cocoon Color and Other Characters in Silkworms, by C. Jucci (pp. 377–379); Cytological Studies in the Diploid Offspring of a Haploid *Oenothera*, by J. A. Leliveld (pp. 380, 381); The Genetic Relations Between Coat Color and Eye Color of Rabbits [trans. title], by H. Nachtsheim (pp. 381–383); Does the Environment Cause Genetical Change in Man? by B. Rosiński (pp. 383–385); Epilepsy, Twins, and Heredity, by J. Sanders (pp. 385–387); The Inheritance of Two Types of Taste Deficiency in Man, by L. H. Snyder (pp. 387, 388); Photographic Analysis of a Tetrapolar Spore of *Pleurotus* [trans. title], by R. Vandendries (pp. 388, 389); and A Case of General Albinism [trans. title], by T. Wlissidis (p. 389).

Calculation and interpretation of analysis of variance and covariance, G. W. Snedecor (*Iowa State Col., Div. Indus. Sci. Monog. 1 (1934), pp. [8]+96*).—A brief account is given, with examples, of methods of analyzing variation and correlation in biological data.

The symbolizing of hereditary factors, H. de Haan (*Genetica ['s Gravenhage], 15 (1933), No. 1–2, pp. 1–22*).—Suggestions are presented for the use of a uniform, concise, and clear-cut system of symbols for genetic characters which it is hoped may have international application.

The specific formula of heredity, H. H. Laughlin (*Natl. Acad. Sci. Proc., 19 (1933), No. 12, pp. 1020–1022, fig. 1*).—This is a further discussion of the application of the specific formula of heredity, based on the general formula of heredity previously noted (E.S.R., 70, p. 169).

The gene theory in relation to blending inheritance, W. E. Castle (*Natl. Acad. Sci. Proc., 19 (1933), No. 12, pp. 1011–1015*).—The hypothesis that blend-

ing inheritance is determined by chromosomal genes is discussed and numerous examples cited which have not been able to substantiate this hypothesis, especially that involving size in rabbits. While it is recognized that the chromosomes furnish a mechanism for the transmission of characters following the Mendelian law, it is suggested that the cytoplasm of the germ cells may have the power to influence the characters in a manner similar to observed cases of blending inheritance. It is also suggested that the egg would have a better opportunity to function in cytoplasmic inheritance than the spermatozoa.

On the genetic nature of induced mutations in plants.—II, A haplo-viable deficiency in maize, L. J. Stadler (*Missouri Sta. Res. Bul. 204 (1933), pp. 29, figs. 13*).—Numerous X-ray induced variations in corn, eliminated in part in the gametophyte generation, are intermediate in genetic behavior between typical deficiencies which are wholly eliminated in the gametophyte generation, and typical mutations which are transmitted without loss by both male and female gametophytes. These variations are commonly considered mutations of reduced viability, as indicated in part 1, noted on page 29.

A case of this type involving the gene *R* was found due to the loss of a terminal segment of chromosome X, about one sixth of the length of the entire chromosome. The deficiency designated X-1 is transmitted through the female gametophyte, with somewhat lowered viability, but not through the male gametophyte.

The effects of deficiency X-1 have been summarized. The deficiency male gametophyte develops apparently normally until some time after the first nuclear division. The second nuclear division is delayed somewhat in deficient microspores, but apparently proceeds normally. At the time of pollen-shedding, the deficient pollen grains are small and still incompletely filled, and after shedding they shrivel much more quickly than the mature nondeficient pollen grains. If deficient pollen grains are placed immediately on receptive silks, streaming movements and digestion of reserves proceed as in the nondeficient grains, but emergence of the pollen tube rarely or never occurs.

The deficient female gametophyte, like the nondeficient, undergoes three nuclar divisions, producing an embryo sac of eight cells. At pollination approximately half of the ovules of the heterozygous plant contain embryo sacs of reduced size and subnormal development. Deficient female gametophytes are functional, although with much reduced fertility. Ears of plants heterozygous for the deficiency produce less than one fifth as many deficient as nondeficient seeds. The proportion of germless seeds produced is higher among deficient female gametophytes than among nondeficient gametophytes of the same ears. If heterozygous for the deficiency, seeds are slightly reduced in size, and plants are probably reduced slightly in size and delayed slightly in flowering.

Cytological features of Nicotiana glutinosa haplonts, J. M. Webber (*Jour. Agr. Res. [U.S.], 47 (1933), No. 11, pp. 845–867, pls. 4, figs. 8*).—Studies at the University of California and the U.S. Department of Agriculture on several haplont plants of *N. glutinosa* furnished information on chromosome morphology in haplonts and diplonts of this species, occurrence of diploid tissues, chromosome doubling, and meioses in pollen mother cells and egg mother cells of haplont *N. glutinosa*. These and related phenomena are discussed in some detail.

Correlated inheritance of reaction to diseases and of certain botanical characters in triangular wheat crosses, E. R. Ausemus (*Jour. Agr. Res. [U.S.], 48 (1934), No. 1, pp. 31–57, figs. 5*).—Studies were made of the manner [illegible] stem rust (*Puccinia graminis*), bunt (*Tilletia

tritici), and black chaff (*Bacterium translucens undulosum*), and awnedness and color of coleoptile in triangular crosses of three spring wheat varieties, Hope, Marquillo, and Supreme (*Triticum vulgare*). Each individual character was studied for its mode of inheritance, then for the independence of the different combinations of characters. The relationship between stomatal behavior and mature plant reaction to stem rust in the field was also studied. Stem rust and bunt reaction were studied under artificial epidemic conditions.

The inheritance of the mature plant reaction to stem rust in the Hope × Marquillo cross appeared to depend on three or more factors. The factors controlling the inheritance of the mature plant semiresistance of the Marquillo were not allelomorphic to those controlling the Hope type of mature plant resistance. In the Hope × Supreme cross inheritance of the mature plant resistance appeared to depend on at least 2 factors, and in the Marquillo × Supreme cross at least 3 factors were concerned. Seedling reaction of the F_3 lines in the greenhouse to physiologic form 36 of stem rust depended on a single factor pair in the two crosses Hope × Marquillo and Hope × Supreme. All the F_3 lines were susceptible in the Marquillo × Supreme cross.

It was impossible to determine the number of genetic factors involved in the inheritance of reaction to bunt and black chaff in the crosses studied. Segregation did not occur in the Marquillo × Supreme cross for black chaff.

In the Hope (awned) × Marquillo (awnleted) cross, segregation of the awn character depended on a single factor difference, in the Hope × Supreme (awnless) 2 factors appeared to be involved, and in the Marquillo × Supreme cross 1 factor.

Hope has a purple coleoptile and Marquillo and Supreme are green in the seedling stage in the greenhouse. In the Hope × Marquillo and Hope × Supreme crosses inheritance appeared to be on a single factor pair basis. All the F_3 plants in the Marquillo × Supreme were green.

The inheritance of the following combinations of characters appeared to be independent as determined by the χ^2 test for independence: Mature plant reaction to stem rust in relation to bunt, seedling reaction to stem rust form 36 (except in Hope × Marquillo), awnedness, and color of coleoptile; black chaff in relation to bunt, seedling reaction, awnedness, and color of coleoptile; bunt in relation to seedling reaction, awnedness, and color of coleoptile; awnedness in relation to seedling reaction and color of coleoptile; and seedling reaction in relation to color of coleoptile. There was a tendency to linkage or association of mature plant reaction to stem rust and seedling reaction in the Hope × Marquillo cross and mature plant reaction to stem rust and reaction to black chaff in the two crosses with Hope as one of the parents.

There did not appear to be any relationship between stomatal behavior and mature plant reaction in resistant, semiresistant, and susceptible F_4 lines of the three crosses studied.

Correlated inheritance of reaction to stem rust, leaf rust, bunt, and black chaff in spring-wheat crosses, H. K. Hayes, E. R. Ausemus, E. C. Stakman, and R. H. Bamberg (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 1, pp. 59-66*).—The correlated reaction to stem rust, leaf rust, bunt, and black chaff was studied at the Minnesota Experiment Station, in the F_3 progeny of wheat crosses between H-44 with Double Cross No. II-21-28 and Kota × Marquis No. II-19-167, respectively, and H-35 × Marquis. Stem rust resistance of the mature plant type of the H-44 parent appeared to be dependent upon a single genetic factor difference. The moderate plant resistance of Nos. II-21-28 and II-19-167 appeared to be dependent upon factors not allelomorphic to those determining the mature plant resistance of the H-44 type, as susceptible lines

to explain the stem rust resistance of the mature plants of the H–35 parent in the crosses with Marquis. The number of factor pairs responsible for segregation of factors for reaction to leaf rust, bunt, and black chaff could not be determined.

The inheritance of reaction to the following combinations of diseases appeared to be independent as determined by the χ^2 test for independence: Stem rust and bunt, leaf rust and bunt, leaf rust and black chaff, and black chaff and bunt. There appeared to be linkage in inheritance of reaction to stem rust and leaf rust, and of reaction to stem rust and black chaff. However, it appears possible to combine the mature plant stem rust resistance of the H–44 type with the black chaff resistance of many varieties and hybrids of common wheat.

Recent results of investigations of sex in rust fungi [trans. title], N. F. Buchwald (*Nord. Jordbrugsforsk., 1933, No. 2, pp. 131–148, figs. 6*).—An introduction gives a historical sketch of the development of the author's knowledge of the propagation of the rust fungi, starting with the works of F. J. F. Meyen and L. R. Tulasne and ending with the cytological investigations of Blackman, Christman, and others. The following chapter is a review of the classical experiments of J. H. Craigie (1927, 1928, and 1931) and the cytological investigations of R. F. Allen (1930 and 1932). The last part gives a detailed summary of a paper by Andrus (E.S.R., 65, p. 145).—(*Courtesy Biol. Abs.*)

Studies in human inheritance.—X, A table to determine the proportion of recessives to be expected in various matings involving a unit character, L. H. Snyder (*Genetics, 19 (1934), No. 1, pp. 1–17*).—Continuing this series (E.S.R., 69, p. 508), data have been tabulated from formulas derived for determining the proportion of recessive individuals in the general population, the proportion of offspring to be expected in random matings of dominants with dominants, and the proportion of offspring to be expected in random matings of dominants with recessives.

Linkage interrelations of three genes for rex (short) coat in the rabbit, W. E. Castle and H. Nachtsheim (*Natl. Acad. Sci. Proc., 19 (1933), No. 12, pp. 1006–1011*).—In a study at the Bussey Institution of the linkage relationships between the three genes in rabbits designated as r_1, r_2, and r_3, all of which in the recessive condition cause the production of the short-haired typical coat of the rex rabbit, races referred to as rex 1 and rex 2 were found to be independent of all previously known genes. The F_2 animals from a cross involving rex 1 and rex 2 were normal and short-haired in approximately equal numbers, indicating that the two genes for rex were linked. Backcrosses of the F_2 short-haired individuals further substantiated the linkage relationship. Twelve cross-over individuals were observed among 51 F_1 rabbits produced, a cross-over percentage of 11.7±2.1. Crossing individuals of the rex 1 strain with the rex 3 strain showed independent inheritance, as did also the cross of the rex 2 and rex 3 strains.

Plumage and eye color inheritance in the Single Comb Rhode Island Red fowl, D. C. Warren and C. D. Gordon (*Jour. Agr. Res. [U.S.], 47 (1933), No. 11, pp. 897–910, fig. 1*).—The results of a study conducted at the Kansas Experiment Station on the genetics of variations in the standard color of plumage and eyes in the Single Comb Rhode Island Red fowl are reported. The variations in the color of the back, breast, hackle, underplumage, and flight feathers, and the eye color of more than 3,000 birds are tabulated.

The results indicated rather definitely that the plumage-color variations were hereditary, but the basis for the inheritance of these colors seemed too complicated to permit separate analyses. However, the results supported the

color variations was observed in that males averaged darker in color than females. No evidence of sex linkage was observed. Variation in eye color did not seem to be hereditary.

Creeper and single-comb linkage in fowl, W. LANDAUER (*Nature* [*London*], *132* (*1933*), *No. 3337, p. 606*).—Continuing the study of linkage between the genes for creeper and single comb in the fowl at the [Connecticut] Storrs Station (E.S.R., 69, p. 196), a total of 4,313 individuals were produced from matings of heterozygous Creeper females with normal males, which exhibited 0.56 percent of crossing over, and 7,408 back-cross chicks exhibiting 0.39 percent of crossing over. The new data obtained in the third laying year showed no striking changes in the percentage of crossing over, and indicated that age was not a factor influencing the rate of crossing over.

The maceration and resorption of fetuses in the rat, E. L. COREY (*Anat. Rec., 56* (*1933*), *No. 2, pp. 195–209, pl. 1, figs. 6*).—Cases of maceration and resorption of near-term fetuses in the rat, separated from the maternal blood supply in the uterus or placed free in the maternal peritoneal cavity, are described, together with the effects of such fetuses on the general health and leucocyte count of the dam.

Ovogenesis in the ewe and cow, H. H. COLE (*Soc. Expt. Biol. and Med. Proc., 31* (*1933*), *No. 2, pp. 241–243*).—A histological study of 25 pairs of ewes' ovaries and a similar number of cows' ovaries, removed at various phases of the oestrous cycle, gave no evidence indicating that new ova arise from the germinal epithelium from sexually mature animals. The appearance of healthy follicles during oestrum indicated that the probable development of a definitive ovum takes place over two or more cycles.

Internal migration of ova in the cat, J. E. MARKEE and J. C. HINSEY (*Soc. Expt. Biol. and Med. Proc., 31* (*1933*), *No. 2, pp. 267–270*).—To study the migration of ova in the cat, the right uterine horn was ligated or sectioned in 7 animals. At the seventh week of pregnancy fetuses were found in both cornua of 6 of the cats. Twenty-one fetuses were produced by these animals, of which 10 were located in the right horn and 11 in the left. The average litter size of another series of animals was 4.7.

Some observations on living eggs and blastulae of the albino rat, A. DEFRISE (*Anat. Rec., 57* (*1933*), *No. 3, pp. 239–250, figs. 9*).—Attempts to culture rat ova removed from the tubes and uterine cavity showed them to be very sensitive to variations in temperature, osmotic pressure, and pH. Difficulties were noted in obtaining normal development of these ova in vitro. Irregularities of the cleavage stages of the ova and blastomeres were noted in case of normally developing eggs.

Effect of hypophysectomy on the ovary of immature rats, H. SELYE (*Soc. Expt. Biol. and Med. Proc., 31* (*1933*), *No. 2, pp. 262–264, figs. 2*).—The effect of hypophysectomy of female rats at 18 days of age on the condition of the ovary from 10 to 25 days later was studied. It is concluded that the hypophysis has a definite trophic influence on the ovary of the rat long before the animal reaches maturity. This was based on the transformation of the thecal cells into deficiency cells which occurs around the atretic follicles and apparently in those cells which respond to the administration of the hormone of the anterior lobe of the hypophysis in the immature rodent.

Effect of anterior pituitary-like hormone on the ovary of the hypophysectomized mouse, H. SELYE, J. B. COLLIP, and D. L. THOMSON (*Soc. Expt. Biol. and Med. Proc., 31* (*1933*), *No. 2, pp. 264, 265*).—In this test 10 adult female hypophysectomized mice were given 9 daily doses of 5 units of the anterior pituitary lobe hormone and were subsequently killed for post-mortem

examination. No normal corpora lutea were observed in these animals, indicating that postpubertal treatment with this hormone does not lead to the formation of corpora lutea, although there was luteinization in the follicle cells.

Ovarian response of hypophysectomized rats to urinary follicle-stimulating principle, S. L. Leonard and P. E. Smith *(Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 2, pp. 283, 284)*.—A definite qualitative difference in the effect resulting from the administration of follicle-stimulating urine and pregnancy urine was obtained by use of hypophysectomized rats. The ovaries of animals treated with the urine of the menopause were similar to those of normal immature rats precociously matured by anterior pituitary implants. However, injections of the follicle-stimulating urine extract did not induce ovulation after hypophysectomy. Pregnancy urine extracts did not induce follicular growth after hypophysectomy.

Pregnancy changes in the anterior hypophysis of the albino rat, J. M. Wolfe and R. Cleveland *(Anat. Rec., 56 (1933), No. 1, pp. 33–45, figs. 2)*.—A description is given of changes in the cells of the hypophysis of rats at different periods during pregnancy. It is of interest that no specialized pregnancy cells were observed.

A sex difference in pituitary size and intestinal length in doves and pigeons, O. Riddle and T. C. Nussmann *(Anat. Rec., 57 (1933), No. 2, pp. 197–204)*.—Data are reported on intestinal length, body weight, and whole and anterior pituitary weights, together with ratios between them of 305 healthy ring doves and 227 common pigeons, according to sex and race. The females were found to have relatively larger whole pituitaries and anterior lobes and longer intestinal tracts than males. Some suggestion was given that races with larger and smaller pituitaries and longer and shorter intestines have been established in the colony of pigeons at the Carnegie Institution.

The effect of daily hetero-pituitary implants into adult but sexually inactive male ground squirrels, G. E. Johnson, E. L. Gann, M. A. Foster, and R. M. Coco *(Endocrinology, 18 (1934), No. 1, pp. 86–96, figs. 9)*.—Implantation of rat anterior pituitary glands into 12 sexually inactive adult male ground squirrels produced an average increase in the size of the testicles of 28 percent in three dimensions, and over 100 percent in volume. Seminiferous tubules likewise increased in diameter, and more advanced stages of spermatozoa formation were observed. The accessory reproductive organs also showed moderate increases in size.

Experimental studies on the hypophysis cerebri.—II, The effect of castration in the male albino rat, S. I. Stein *(Anat. Rec., 56 (1933), No. 1, pp. 15–29, figs. 2)*.—Continuing this series (E.S.R., 69, p. 512), the influence of castration on body weight and length and weight of the hypophysis was studied in 5 groups of rats, 2 of which were controls. Two groups of 9 and 7 animals were castrated without the removal of the epididymis at 23 days of age, and were killed at 68 and 88 days, respectively, after castration. The epididymis was removed with the testicles from the third group and autopsy made 88 days later.

The results showed that castration with or without removal of the epididymis significantly increased the weight of the anterior lobe of the hypophysis, but did not affect the weight of the posterior lobe or intermediate portions of the gland. The hypophysis of the castrated animals showed the presence of a considerable amount of colloid, with practically none in the glands of the control animals. Changes in the character of the cells of the hypophysis with the presence of large basophilic castration cells were also noted as a result of castration. The weight and body length of control animals were greater than

The sexual cycle in the human female as revealed by vaginal smears, G. N. PAPANICOLAOU (*Amer. Jour. Anat., 52 (1933), No. 3, Sup., pp. 519–637, pls. 10, figs 3*).—A description is given of the vaginal smears from 12 selected normal women during several successive oestrous periods.

The production of mucified cells in the vaginal epithelium of certain rodents by oestrin and by corpus luteum extracts, R. K. MEYER and W. M. ALLEN (*Anat. Rec., 56 (1933), No. 4, pp. 321–343, pls. 3*).—In studies of the administration of extracts of the corpus luteum containing both oestrin and progestin to castrated female mice and guinea pigs, it was found that mucification of the vaginal epithelium resulted. Injections of large amounts of oestrin caused mucified cells to be desquamated and replaced by stratified or cornified cells.

Oestrogenic hormones (*Nature [London], 132 (1933), No. 3337, pp. 609, 610*).—A brief summary of the more recent researches bearing on the chemical composition of the oestrogenic hormones.

Assay with the guinea pig of the lactogenic hypophyseal hormone, W. R. LYONS and H. R. CATCHPOLE (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 2, pp. 299–301*).—Lactation was induced in rabbits, guinea pigs, cows, dogs, a monkey, and an opossum by the use of the lactogenic hypophyseal hormone, but rats were poorly responsive. Guinea pigs proved particularly successful in these experiments. A serous secretion was induced in 8 hours, and it was possible " to express milk in streams within 24 hours." Removal of the ovaries from test animals is suggested for best results.

Induction of lactation in heifers with the hypophyseal lactogenic hormone, H. R. CATCHPOLE, W. R. LYONS, and W. M. REGAN (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 2, pp. 301–303*).—The administration of 10 cc of the lactogenic hormone to a Holstein heifer 16 mo. of age caused milk secretion in 11 days. On analysis the milk proved within normal variations, although its flavor was criticized. A control animal having the udder manipulated twice daily for 22 days produced a few drops of salty serous fluid.

An Ayrshire heifer 12 mo. of age failed at first to respond to injections of the lactogenic hormone, but after a second injection following a heat period 80 cc of milk was produced. This is considered indicative of the influence of an ovarian factor in the preparation of the mammary gland for stimulation by the lactogenic hormone.

Experiments with hypophyseal lactogenic hormone on normal ovariectomized and hypophysectomized dogs, W. R. LYONS, I. L. CHAIKOFF, and F. L. REICHERT (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 2, pp. 303–305*).—Subcutaneous injections representing a total of 20 mg of crude lactogenic hormone sufficed to cause a secretion of milk in parous and nonparous mature bitches. Two immature bitches failed, however, to respond. Lactation was continued about two weeks after the last injection.

The clinical use of prolactin, R. KURZROK, R. W. BATES, O. RIDDLE, and E. G. MILLER, JR. (*Endocrinology, 18 (1934), No. 1, pp. 18, 19*).—Data are reported on increased milk production resulting from the therapeutic administration of prolactin to 25 women in whom little milk was produced following parturition.

Milk-production curve of albino mice, E. V. ENZMANN (*Anat. Rec., 56 (1933), No. 4, pp. 345–358, figs. 6*).—Data are presented on the milk production of albino mice, based on the weights of the young before and after suckling. Milk production showed a direct relationship to the size of litter. The milk-production curve rose from parturition until about the tenth day and declined from then until the completion of weaning.

Data are also presented for the litters on daily losses in feces, urine, and from other sources.

Hatchability of eggs (*[Connecticut] Storrs Sta. Bul. 192 (1933), pp. 13, 14*).—A brief report is given of investigations relating to the presence of a lethal gene in the Cornish Game fowl; bone growth in the Creeper fowl before and after hatching; nature of the creeper gene; susceptibility of creeper genes to vitamin D deficiencies; and investigations of the endocrine system of Frizzle fowls, particularly the thyroid and pituitary, in cooperation with S. D. Aberle.

Bovine sterility, W. L. Boyd (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 791–798*).—In this article from the Minnesota Experiment Station, the author discusses the role of the corpus luteum in sterility and sterility in the male of the bovine species.

FIELD CROPS

[Agronomic research in Connecticut] (*Connecticut [New Haven] Sta. Bul. 357 (1934), pp. 129, 130, 134–137, 138–140, 141, 142*).—Progress is reported from breeding work with Havana seed strains of tobacco; genetic studies and variety tests with corn; fertilizer and spraying and dusting experiments with potatoes; fertilizer and curing studies with sweetpotatoes; and experiments with tobacco at the Tobacco Substation, dealing with cause of seed bed failures, nitrogenous fertilizers, fertilizer placement, soil nitrification, diagnosis of nutrient deficiencies in tobacco soil, and conservation of nutrients by cover crops.

[Field crops studies at the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 192 (1933), pp. 5, 6*).—Brief progress reports are given on experiments on the maintenance and improvement of permanent pastures, trials of pasture grasses and legumes, and fertilizer experiments with potatoes.

[Report of field crops work in Michigan], E. J. Miller and H. C. Rather (*Michigan Sta. Rpt. 1932, pp. 207 240–242*).—Brief accounts of research not noted earlier describe the merits of Katahdin potatoes for Michigan, production of certified potato seed in Michigan, curing methods for soybean and Sudan grass hay, cultivation tests with field beans, combination of cereals as oats and barley grown for feed, factors influencing quality of soft winter wheat in Michigan, and evaluation of baking qualities of flours from these wheats.

[Field crops experiments in South Carolina], H. P. Cooper, B. E. G. Prichard, E. E. Hall, R. W. Wallace, W. B. Rogers, C. H. Arndt, G. M. Armstrong, C. C. Bennett, E. C. Elting, J. P. LaMaster, J. H. Mitchell, C. S. Patrick, E. D. Kyzer, T. M. Clyburn, S. J. Watson, J. D. McCown, W. B. Albert, J. H. Beattie, W. M. Lunn, H. A. McGee, J. E. Adams, W. A. Carns, and E. W. Faires (*South Carolina Sta. Rpt. 1933, pp. 17–25, 41–43, 45–49, 55, 56, 119, 120, 121–124, 128–139, 140–143, 147–153, 156–162, 165–168, figs. 8*).—Brief reports are given on the progress of agronomic investigations (E.S.R., 68, p. 754), carried on at the station and its substations (in certain lines in cooperation with the U.S. Department of Agriculture), including variety trials with cotton, corn, wheat, oats, barley, sweetpotatoes, soybeans, cowpeas, lespedeza, crotalaria for soil improvement, winter legumes for cover crops, jackbeans, and pasture grasses; fertilizer experiments with cotton, soybeans, sweetpotatoes, tobacco, winter legumes, and pasture; effects of dolomitic limestone on yields and calcium and magnesium deficiency symptoms in crops; legume cover crops, and manure v. green manure for cotton; potash and green manures for corn; cultural (including planting) tests with cotton, corn, and oats; rotations for oats; intercropping of corn and different legumes; cutting tests with *Lespedeza sericea*; cotton research embracing effects of origin and age of seed on

germination and seedling growth, seed treatments, cold resistance of seedlings of varieties and strains, fertilizer placement, time of planting tests, and study of length and structure of fibers, especially as affected by soil moisture conditions; a comparison of methods of preparing cut-over coastal lands for carpet grass pasture; effects of lime and fertilizers and of basic slag and superphosphate on the growth and composition of carpet grass; development of a permanent pasture for dairy herd by clearing, disking, reseeding, fertilization, liming, and other practices; eradication of shrubs and weeds from pastures; controlled grazing of Napier grass; and experiments on the effects of certain common weeds on yield and quality of tobacco. Fertilizer formulas are again recommended for bright flue-cured tobacco and for plant beds.

Adaptability of alfalfa strains and varieties for Idaho, H. W. HULBERT, J. H. CHRIST, and J. L. TOEVS (*Idaho Sta. Bul. 199 (1933), pp. 19, fig. 1*).—The hay yields, stands, and comparative winter survival of a number of alfalfa strains grown at the station, Sandpoint, and Winchester, for various periods between 1923 and 1933, indicated that hardy or variegated alfalfas, especially Grimm and Ladak, are best adapted for planting in Idaho. Spanish, Italian, and Argentine alfalfas and seed from the Southwest and California, regardless of the elevation where grown, are considered entirely unadapted to Idaho.

In tests of seven varieties during four years for wilt resistance, Turkistan, a lower yielding variety, showed considerable evidence of resistance. Cossack, common, and Ladak exhibited some resistance, but not so much as Turkistan, while Hardigan, French, and Grimm all proved very susceptible.

Effect of manure and of phosphorus fertilizer on the yield and composition of alfalfa hay, D. W. PITTMAN (*Utah Sta. Bul. 247 (1934), pp. 12, fig. 1*).—Examination of alfalfa grown on a series of plats at North Logan on a deep, uniform, calcareous loam, high in total but low in available phosphorus, following corn and fallow on land which for 21 yr. previous received 0, 5, 10, 20, 30, and 40 in. of irrigation and 0, 5, and 15 tons of manure per acre, revealed that neither the yield nor phosphorus content of the alfalfa was influenced appreciably either by previous cropping or irrigation treatments, but that the previous manuring markedly increased both the yield and the phosphorus content of the hay. The correlation between yield and phosphorus content of the hay was unusually high. Data are given from other experiments in the State showing response of alfalfa in increased yield and phosphorus content to applications of manure or phosphorus carriers.

The relative growth and development of corn varieties of widely different maturity dates during successive time intervals throughout their life cycle, R. G. WIGGANS (*[New York] Cornell Sta. Mem. 152 (1934), pp. 36, figs. 7*).—The corn varieties Eureka (late), Luce Favorite (medium late), Cornell 11 (medium early), and Early Huron (early), representing widely different types, especially in length of season for maturity, were harvested from 1920 to 1926, inclusive, at intervals from the late seedling stage until September 30, the latest harvest date for silage in New York, and too late for safety. Conclusions based on a study of green and dry weight, production, grain content of silage, and observations during growth may be summarized as follows:

The longer the growing season required for a corn variety to mature the greater will be the total green weight produced by silage-harvest time, provided the corn has passed flowering. While no consistent and pronounced differences in percentage of dry matter exist among widely different varieties during early growth stages, significant differences develop before tasseling and increase as the season advances. The earlier the variety of corn the higher is the percentage of dry-matter content at any time after the very early stages and

before full maturity. During early stages of development, varieties requiring long growing seasons are low in dry-weight production as compared with earlier types, a difference not overcome until nearly August 15. After September 20, the later the type of corn the greater is the total production of dry weight, but not in proportion to the green weight. A medium-late type of corn will have produced as much dry matter by early silage-cutting time as will a late type, and only slightly less at the close, e.g., Eureka averaged only 3 percent more than Luce Favorite.

The largest green-weight increase for the four types occurred in the same period, August 1–10, but thereafter increases in green weight during similar time intervals grew less and less until actual losses were registered in all varieties for the last 10 days. The largest increase in dry weight also occurred, with one exception, during August 1–10. During the three succeeding periods the increases in dry weight continued at a rate approaching constancy, but thereafter the increase grew smaller as the end of the season approached. Equal green weights equivalent in feeding value occurred at widely different dates for the four types, e.g., approximately 10.67 tons of green weight of the four varieties was equal to 2 tons of dry weight at the following dates: Early Huron on August 28, Cornell 11 on September 2, Luce Favorite on September 14, and Eureka on September 30. The amount of water necessary to be handled at any given date for an equal quantity of dry matter was found to vary greatly with the variety. On September 20, an average of 2.9 tons more of Eureka than of Cornell 11, 2.2 tons more of Luce Favorite, and 0.4 ton less of Early Huron were required to supply 2 tons of dry matter. The percentage of grain in the dry matter of the four varieties varied from 0 to 36.2 on September 20, the ideal date for silage harvest in the region. The larger proportion of the grain produced after September 20 was produced at the expense of previously elaborated materials temporarily stored in stalks and leaves.

Corn varieties similar to Eureka or Early Huron fail to justify their use as silage corn under conditions comparable to those prevailing in central New York. The final choice between the other two types must be left to the producer. The best type of corn for silage is defined as one which utilizes the growing season to the best advantage in the production of dry matter, but which at the same time reaches, at least 3 yr. out of 5, a stage of maturity which loosely may be described as the dough stage. This type, according to the data reported, is one which reaches its full development early enough to utilize a considerable period for internal development, but not sufficiently early to mature.

Fertilizer mixtures with and without ground limestone for cotton, J. T. Williamson (*Amer. Fert., 80 (1934), No. 3, pp. 5, 6, 26*).—The efficiency of a 6–10–4 fertilizer consisting of ammonium sulfate, superphosphate, and potassium chloride, with and without about enough calcium carbonate as marble dust or dolomite to correct the acidity caused by the ammonium sulfate, was compared by the Alabama Experiment Station in cooperation with farmers. Marble dust was about as effective in the average of 112 experiments as dolomite, which averaged only 13 lb. more seed cotton. Dolomite broadcasted in 1932 at a rate sufficient to neutralize the acidity from the annual application of ammonium sulfate for 5 yr. gave during the first 2 yr. almost the same results, except on Clarkesville soils, as dolomite applied annually as part of the fertilizer mixture. In these experiments it has been a good practice to add enough lime to the fertilizer to neutralize the acid from the acid-forming materials in the mixture. The limestone added in no case seemed to cause either a loss of ammonia or a decrease in the availability of the superphosphate

sufficient to reduce the yields. Except on one soil group, there were yield increases of 40 lb. or more seed cotton per acre where ground limestone was mixed with the fertilizer.

Flax production in Kansas, I. K. LANDON (*Kansas Sta. Circ. 173 (1934), pp. 16, figs. 3*).—Cultural methods and field practices are suggested for growing seed flax in southeastern Kansas from experience and results of variety, tillage, cultural, rotation, and fertilizer tests on experiment fields in that part of the State. Other features of seed flax production are noted briefly.

Flax is said to be as profitable as wheat and more so than oats in southeastern Kansas, is not hard on the land, its straw is high in feeding value, and its inclusion in small-grain farming systems makes for more efficient labor distribution. It has few disease and insect problems, is an excellent nurse crop, and leaves the soil in good physical condition. The crop thrives best on heavy, cold lands, but will not compete with weeds so successfully as small grains. Legumes in the rotation increase the flax yields. Small-grain stubble plowed in July produced three times as much flax as similar stubble plowed in December. Linota, well adapted in southeastern Kansas and wilt-resistant, made the highest yield among varieties tested. Three pecks of seed per acre should be drilled preferably or broadcasted on an early-prepared, firm, well-pulverized seed bed as soon after March 15 as possible and covered not more than 1 in. Commercial fertilizers are not recommended, and while manure increases the yield it should be applied to a cultivated crop before the flax. Flax should be harvested with a self-rake reaper, binder, or combine. When the bolls are ripe and the stems are drying, and when cured sufficiently, it should be threshed or stacked. Kansas flax evidently should be marketed before the bulk of the northern crop has depressed the price.

Lespedeza sericea: The newest legume for Missouri, C. A. HELM and W. C. ETHERIDGE (*Missouri Sta. Bul. 331 (1933), pp. 15, figs. 9*).—The growth habits, soil and cultural requirements, drought and cold resistance, and utilization of *L. sericea* for hay, seed, and pasture are summarized from experiments in cooperation with the U.S.D.A. Bureau of Plant Industry.

While *L. sericea* can be grown without fertilizers or lime on all soils in Missouri, its value as a crop on extremely poor land has not yet been established. The experiments reported and practical observations indicated that the best use of *L. sericea* will be as a hay crop on land of medium to somewhat less than medium fertility, where it may well replace alfalfa, sweetclover, or red clover, which cannot be grown there without expensive soil treatments. However, *L. sericea* cannot compete as a hay crop with alfalfa or red clover on land which naturally can produce these legumes successfully, nor is it likely to equal Korean lespedeza for pasture on any kind of land. *L. sericea* in Missouri may be expected to produce two crops of hay in a season, or one crop of hay and one of seed, or one crop of hay followed by summer pasture. Cultural suggestions include shallow seeding on a firm or even solid seed bed with wheat or barley in late spring, scarified seed at the rate of 25 lb. per acre, cutting before the bloom stage for hay, and harvesting for seed with a grain binder.

Effect on subsequent yields of storing cut seed potatoes at different temperatures and humidities, R. C. WRIGHT, W. M. PEACOCK, and T. M. WHITEMAN (*U.S. Dept. Agr., Tech. Bul. 394 (1934), pp. 20, figs. 8*).—The yields and stands from cut sets of several potato varieties stored, after cutting, at different temperatures and relative humidities for different periods were determined at Arlington, Va., during several years in comparison with seed stored whole in medium humidity at the same temperatures and cut just before planting.

A satisfactory healing or corking over of the cut surfaces of the sets was observed to take place at about 60° F., with high relative humidity. Sets held under these conditions remained firmer, were generally free from mold growth, and the cut surfaces were less easily cracked in handling. Usually as good and in some cases better yields were had from the cut sets than from comparable whole seed. The cut lots usually produced quicker and more vigorous growth, with from 7 to 10 days earlier maturity, and the crops showed more uniformity in size with fewer oversized tubers. Practices are suggested for the grower who desires to cut seed potatoes before planting, with the suggestion that somewhat different results might be obtained under different soil and climatic conditions than in these experiments.

Varieties of rice for Texas, R. H. WYCHE and H. M. BEACHELL (*Texas Sta. Bul. 485 (1933), pp. 22, figs. 9*).—The yields of 88 varieties of rice grown at Beaumont from 1914 to 1932, inclusive, in cooperation with the U.S. Department of Agriculture, are reported, with data on grain type, time of maturity, and milling quality of the better varieties.

Blue Rose and Supreme Blue Rose, the most desirable late rices tested and the principal sorts grown in the humid part of the Gulf Coast prairie, produce high yields and have medium long grains of good milling quality. Early Prolific, the most promising early variety, is a medium-grain, high-yielding rice, but often produces grain of inferior milling quality. Storm Proof, Edith, and Lady Wright, early-maturing, long-grain varieties that can be used to advantage, yield somewhat less than Early Prolific. Texas Fortuna, outstanding as a medium-late variety, is a long-grain rice very popular in the region. Delitus, a long-slender-grain rice medium-late in maturity, has produced fair yields. Rexoro, a promising long-slender-grain rice, matures very late, but produces satisfactory yields when planted before May 1. The planting of the short-grain types, it appears, should be limited to the demand for rice of this type. Caloro, Piniling Daniel, and Acadia are good short-grain varieties of early, medium-late, and late maturity, respectively.

[Sugarcane research in Cuba] (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 5 (1931), pp. 7–144, 307–315, figs. 28; 6 (1932), pp. 7–93, 109–115, figs. 9*).—Papers of agronomic interest, presented at the fifth (E.S.R., 68, p. 612) annual conference of the Association of Cuban Sugar Technologists and reported in English, included the following: The Character and Significance of the Soils of Cuba, by H. H. Bennett (pp. 7–14); The Utilization of Varieties in the Field Control of Sugar Cane Mosaic and Root Diseases in Cuba, by J. A. Faris (pp. 15–18); Summary of Field Experiments at the Cuban Agricultural Experiment Station, by F. B. Cruz (pp. 19–23); Some Observations on Imported Varieties, Soils, etc., at Centrals "Baguanos" and "Tacajo", by D. N. Eaton (pp. 24–39); The New Java-Barbados Seedling Canes in Cuba, by R. Menéndez-Ramos (pp. 40–54); The "Club Azucarero de Cuba" Cane Varieties, by H. G. Sorensen (pp. 55–59); Organic Matter in Cuban Soils, by A. Bonazzi (pp. 60–92); A Practical Illustration of the Importance of Drainage in Some Sugar Cane Soils, by F. Malberti and J. G. Montes (pp. 93–99); The Economy of the Diesel Motor Tractor in Preparing Land for Planting, by P. Pusl (pp. 100–103); Studies and Observations on Soil Fertility, by F. Pöey (pp. 104–111); Effects of Fertilizer Elements on the Sugar Cane Juice, by C. E. Beauchamp (pp. 112–120); The Action of Different Phosphatic Materials in Fertilizers, by W. E. Dickinson (pp. 121–125); Some Soil Animals Affecting Sugar Cane in Cuba, by L. D. Christenson (pp. 126–131); The Mealy Bugs of Sugar Cane, by B. T. Barreto (pp. 132–134); Damage in Left-Over Cane Caused by the Sugar Cane Moth Stalkborer, *Diatraea saccharalis* Fabr., by H. K. Plank (pp. 135–137); Notes on the Diseases Attack-

ing the P.O.J. Canes in Cuba, by C. N. Priode (pp. 138–144); The Cultivation of Truck Crops Between Cane Rows with Irrigation, by T. Irazoqui (pp. 307–313); and Yuca as a Secondary Crop for Sugar Mills, by P. Pusl (pp. 314, 315).

The following papers were presented at the sixth annual conference: Economic Production of a Cane Planting, by A. Bonazzi (pp. 7–14); The Adaptation of Sugar Cane Varieties to Soil Types (pp. 15–21); The Calculation of Mosaic Infection in Highly Resistant Cane Varieties, by R. Menéndez-Ramos (pp. 22–27); Field Experiments in Variety and Fertility Studies, by C. E. Beauchamp (pp. 28–36); Cane Growing on Soils of the Matanzas Clay Type, by F. Pöey (pp. 37–44); Soil Water, by H. Larios (pp. 45–55); The Roots of the Sugar Cane, by A. and J. González (pp. 56–60); Cuban Weeds, by J. T. Roig (pp. 61–84); The Tractor on the Sugar Plantation, by L. M. Johnson (pp. 85, 86); Prospects for the Control of the Sugar Cane Moth Stalkborer (*Diatraea saccharalis* Fab.) in Cuba by Means of Natural Enemies, by L. C. Scaramuzza (pp. 87–93) (E.S.R., 69, p. 556); and Colloids in the Clarification of Juices from Certain Varieties of Cane, by J. C. González Maiz.

Effect of method of sowing on the yield and root and top development of sweetclover in the Red River Valley, R. S. Dunham (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 12, pp. 979–995, figs 3*).—Biennial white sweetclover (*Melilotus alba*) and its variety Grundy County, and biennial yellow (*M. officinalis*) and its variety Albotrea, were grown at Crookston, Minn., by the Minnesota Experiment Station in 1931 and 1932, with companion crops of wheat, oats, and barley, and alone early and alone late, and yields of roots and tops were compared at five growth stages.

Larger yields of tops and roots were obtained from all four sweetclovers when sown with wheat than with oats or barley. The maximum yield of roots was produced in October of the first year by each sweetclover when sown alone in April, and the maximum total weight occurred in October of the first year for all except the Grundy County variety. When sown with a companion crop or alone in June, the maximum total weight was produced 12 times at the second hay crop and 4 times at the first. Stands were not affected greatly by the type of companion crop used. Grundy County produced the lowest yield of roots and biennial white the largest yield of hay. The maximum nitrogen content of roots occurred in October of the first year. The nitrogen percentage in the tops of biennial white was not influenced greatly by methods of planting.

Inspection of agricultural seeds, H. R. Kraybill et al. (*Indiana Sta. Circ. 199* (*1933*), *pp. 12, fig. 1*).—The average percentages of germination, purity, and weed seed content, and for legumes the hard seed content, are tabulated from tests of 1,043 official samples of seed collected from dealers in Indiana during the year ended June 30, 1933.

Colorado weeds, B. J. Thornton and L. W. Durrell (*Colorado Sta. Bul. 403* (*1933*), *pp. 115, figs. 107*).—Practical information is presented on the characteristics of weeds, how they cause losses, their aggressiveness, agencies of introduction and dissemination, growth habits and types of weeds, and on their control by preventing introduction or by various cultural methods and chemical herbicides. The noxious and common weeds of Colorado are described and illustrated with notes on their habitat and control, and texts of the Colorado seed law and weed law, a glossary, and an index are appended. Plants poisonous and injurious to livestock have been considered elsewhere (E.S.R., 57, p. 468).

Sulfuric acid as a penetrating agent in arsenical sprays for weed control, A. S. Crafts (*Hilgardia* [*California Sta.*], *8* (*1933*), *No. 4, pp. 125–147,*

figs. 13).—Continuing the series of reports of research on weed control (E.S.R., 69, p. 520), the present paper describes the reaction of the plant to sulfuric acid, provides data for evaluating the various factors involved, and discusses the relation of these factors to actual spray practice.

In *Elodea* cells killed with strong sulfuric acid, protoplasmic streaming was observed to slow and cease, the protoplasm to become viscous, somewhat swelled, and completely permeable, and the chlorophyll to change to a light yellowish green. The chemical reaction resulting in death of the cell takes place very rapidly in strong acid. A straight-line relation exists between the time rate of killing plant cells and the hydrogen-ion concentration of the solution bathing them.

The foliage of morning-glory when ground had a fairly large buffering capacity. It required 12.5 cc of 0.1 N HCl to shift 10 g of this material from the initial pH of 5.8 to pH 4. The cuticles of many leaves are fairly permeable to water vapor and molecularly dissolved solutes. Sulfuric acid readily diffused into morning-glory leaves. The stomata seem to take little or no part in the penetration of acid sprays. Morning-glory leaves immersed in sulfuric acid solutions of 1.0, 1.5, and 2.0 normal concentrations were killed in about the same time at 100° F. The leaves in 0.5 N acid were killed much more slowly, and lower temperatures also decreased the rate of killing. When morning-glory shoots were dipped in similar acid solutions and allowed to stand with their cut ends in tap water, they were killed at considerably lower rates. Shoots dipped in 0.5 N acid were injured somewhat less rapidly than comparable immersed shoots, and were never killed completely because of the uneven distribution of the acid. Maintaining a saturated atmosphere around these shoots lowered the killing rate, especially for the lower acid concentrations.

Field and laboratory studies showed that for rapid and complete killing of the foliage, a certain minimum quantity of acid must be used, 3 gal. of 1.0 N sulfuric acid per square rod proving satisfactory for average field conditions in California. At the recommended concentrations of acid and arsenic the latter had little buffering action upon the spray solution, but it practically eliminated the corrosive action of the acid upon iron equipment. Since the acid arsenical solution etches and slowly dissolves porcelain, spray pumps should be equipped with brass or bronze-lined cylinders.

HORTICULTURE

[Fruit and vegetable breeding at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 357 (1934), pp. 128, 129, 130*).—Brief reports are presented on the breeding of sweet corn resistant to Stewart's bacterial wilt and the breeding of black raspberries.

[Horticulture at the Michigan Station], E. J. Miller and V. R. Gardner (*Michigan Sta. Rpt. 1932, pp. 207, 246–248*).—Brief reports are presented upon the following activities: The preparation of wax emulsions for protecting nursery stocks, trends in pear production, reasons underlying success or failure in spraying, the management of orchard soils, orchard spraying, prevention of rabbit injury to young fruit trees, breeding of fruits and vegetables, and the propagation of the blueberry.

[Horticulture at the South Carolina Station] (*South Carolina Sta. Rpt. 1933, pp. 99–104, 106–108, 168–170, 171, 172, 175–182, figs. 9*).—Brief reports are presented on the following studies conducted at the main station, namely, apple pollination and sterility investigations, by A. M. Musser and F. S. Andrews; factors influencing the yield of the Fordhook lima bean, by Andrews;

variety tests of peaches and grapes, by Musser; and the breeding of spineless okra and variety tests of vegetables, both by Andrews.

Studies reported from the Sandhill Substation include fertilizer experiments with peaches, variety tests of cantaloups, grapes, and berries, and cultural experiments with asparagus, all by L. E. Scott.

From the Truck Substation are reported the following studies: The fertilizer requirements of vegetables, magnesium deficiency in truck crops, magnesium, potash, and manganese deficiency symptoms in velvetbeans, and manganese deficiency in cabbage, all by H. P. Cooper and W. D. Moore.

The home garden and orchard in the Wichita Valley, L. E. Brooks and C. H. McDowell (*Texas Sta. Circ. 70 (1934), pp. 26, figs. 4*).—General information is presented on culture and varieties of garden, fruit, and ornamental plants.

Asparagus breeding, L. G. Schermerhorn (*N.J. Agr., 16 (1934), No. 1, p. 5*).—Individual plant records taken by the New Jersey Experiment Stations in Palmetto and Carter Special fields revealed a remarkable variation in productivity. In general, plants that were productive one year were productive the succeeding years. Of 1,137 Carter Special plants examined in 1933, 20.8 percent produced only from 1 to 10 spears, whereas 2.3 percent produced 50 or more.

A comparative test of some early sweet corn varieties, A. E. Hutchins (*Minn. Hort., 62 (1934), No. 3, pp. 56, 57, 58*).—Trials at the Minnesota Experiment Station of some 55 varieties, strains, and hybrids of sweet corn showed the hybrids to be generally more uniform in maturity, plant size, and ear size than commercial varieties maturing at the same time. The following yellow sweet corns are recommended: Very early—Golden Gem and Spanish Gold; early—Minhybrid 202, Minhybrid 203, Kingscrost Golden Bantam, Extra Early Golden Bantan, and B13; and medium varieties—Early Golden, Whipple Early Yellow, Golden Sunrise, Whipple Cross, and Top Crossed Whipple.

Descriptions of types of principal American varieties of tomatoes, V. R. Boswell, O. H. Pearson, P. Work, H. D. Brown, J. H. MacGillivray, H. L. Seaton, G. E. Starr, J. J. Bayles, W. H. Friend, L. R. Hawthorn, and H. F. Morris (*U.S. Dept. Agr., Misc. Pub. 160 (1933), pp. 23, pls. 31, figs. 9*).—This monograph, illustrated partly in color and prepared jointly by the Department and the agricultural experiment stations of California, Indiana, Michigan, New York (Cornell), and Texas, presents the results of exhaustive studies of the most widely planted varieties of tomatoes. The principal objective of the studies was the standardization of types.

Tomato breeding, L G. Schermerhorn (*N.J. Agr., 15 (1933), No. 6, pp. 5, 6*).—A new but yet unnamed tomato variety developed by the New Jersey Experiment Stations from a cross between Marglobe and J. T. D. is briefly described. In 1933 this new seedling ripened its fruits 1 week later than Earliana and 11 days earlier than Marglobe.

Tomato breeding, A. F. Yeager (*North Dakota Sta. Bul. 276 (1933), pp. 20, figs. 21*).—Essentially a summarized account of tomato breeding activities at the station, this paper discusses breeding material, cultural and breeding methods, the objectives of the study, and certain of the more promising recently developed varieties, including Early Jumbo, Bison, Golden Bison, Fargo Yellow Pear, and Pink Heart.

Pruning and training tomatoes, H. C. Thompson (*[New York] Cornell Sta. Bul. 580 (1934), pp. 14, figs. 5*).—In experiments covering a total of 6 yr., staked Bonny Best tomato plants trained to a single stem yielded markedly less marketable fruits per plant than did comparable unpruned, untrained plants.

However, because of closer spacing of the staked plants yields per acre frequently favored the treated plants. In general, where the number of pruned plants was more than double the number of unpruned, the pruned produced the larger acre yields.

With respect to quality, the yield of grade 1 fruit followed the same order as the yield of total marketable fruit, although the percentage of grade 1 was slightly higher on the pruned plants. Injuries traceable to sun scald and cracking were greater and soft rot was less abundant on the pruned than unpruned plants. Blossom rot, a factor of little importance in the studies, was more prevalent on the pruned plants.

Summing up, the author concludes that the main advantage from pruning and staking tomatoes is in an increased early yield, the result of more early fruit rather than significantly earlier maturity. The additional cost of growing tomatoes on stakes is pointed out as a factor that must be considered. In general the practice is not considered potentially profitable in New York State, except where early tomatoes command a relatively high price. Pertinent results obtained by other investigators are reviewed in detail.

Suggestions for the 1934 apple crop, A. J. Farley (*N.J. Agr., 15 (1933), No. 6, p. 1*).—Briefly discussing the unfavorable 1933 apple crop, the author stresses the need of controlling scab and insects and properly liming and fertilizing the orchards to keep them in condition for future production.

Pollination studies, H. Hill (*Pomol. and Fruit Growing Soc. Quebec, Ann. Rpt., 39 (1932), pp. 15–19*).—In hand pollinations conducted at Abbotsford, Que., during the 3 yr. 1929–31 the maximum percentages of self-fruitfulness secured in Golden Russet, McIntosh, and Wealthy apples were 2.4, 3.6, and 3.2, respectively, quantities deemed insufficient for crops of commercial value.

In 10 percent cane sugar solution Fameuse, Melba, Oldenburg, Golden Russet, McIntosh, and Wealthy pollens germinated 32, 26, 22, 23, 27, and 29 percent, respectively. At Abbotsford, Oldenburg and McIntosh proved satisfactory pollinizers for Fameuse and Wealthy and Golden Russet for McIntosh. In general conclusion, the author advises that none of the varieties should be grown in solid blocks, and that when Fameuse and McIntosh are interplanted it would be well to include a third variety, such as Melba, to insure adequate pollination.

Correlations between severity of pruning and subsequent growth and fruit yield of apricot trees, H. S. Reed (*Jour. Agr. Res. [U.S.], 48 (1934), No. 1, pp. 1–30, figs. 13*).—A statistical analysis of records taken by the California Experiment Station in an orchard of 280 Royal apricot trees in which were conducted 10 systems of pruning on replicated plats showed little evidence that the quantity of wood removed in pruning had any significant influence upon yields. In the experiment the type of pruning was apparently more of a factor than its severity. However, the severer types of pruning tended to produce fruits of larger average size, especially as the trees became older. No strong correlation was noted between size of fruits and the volume of the crop. There was, however, a significant positive correlation between yield and growth of the preceding year. The higher yields were obtained from trees pruned moderately in winter to the vase type.

Computation of data from a control, a severely pruned, and a lightly pruned plat showed very high positive interannual correlations in trunk size, indicating that the size differences are persistent. The absence of definite interannual correlations in yield is said to suggest that the annual quantity of fruit produced by a tree is dependent on factors other than the preceding season's yield.

Cherry pollination studies in Utah, F. M. Coe (*Utah Sta. Bul. 245 (1934), pp. 53+1, figs. 23*).—Prompted by a tendency for commercial growers to limit

sharply the number of varieties in new plantings and to plant largely Bing, Lambert, and Napoleon, varieties not only self-sterile but intersterile, studies were made of the compatibility of various varietal combinations. Of cherries commonly grown in Utah, Windsor, Black Tartarian (normal strain), Schmidt, and Yellow Spanish were found satisfactory pollinizers for other varieties and at the same time of considerable economic value in themselves. Of the several varieties, Windsor is deemed the most valuable because of hardiness, vigor, productivity, and market value. Schmidt cherries were of large size and good color, but the trees were generally unproductive. Black Republican, Lewelling, Gov. Wood, and Early Purple proved to be good pollinizers but were lacking in size and marketability of the fruit. Deacon and Elkhorn, described as new varieties, gave promise as pollinizers and are recommended for trial. Giant (California type), Chapman, Early Burbank, and Abundance, new varieties, are deemed of no value because of their small size. Seneca and Major Francis, early cherries of the Tartarian type, are recommended for trial where early markets exist. Certain varieties, notably Black Tartarian, were found to consist of distinct types or strains, but none of those discovered appeared superior to established types.

Relation of light intensity to fruit setting in the sour cherry, G. F. Gray (*Michigan Sta. Tech. Bul. 136 (1934), pp. 35, pls. 4, figs. 7*).—Observations on mature Montmorency cherry trees enclosed in screened cages with and without bees, partly covered with muslin to produce different degrees of shading, partly covered with burlap, and in full light indicated that the sour cherry can endure a considerable reduction in light intensity without a material reduction in fruit set. Shading, such as obtained in the usual pollination technic where blossoms are covered with screen, muslin, or paper bags, did not apparently affect normal fruit setting processes in the Montmorency cherry.

However, under burlap there was a considerable reduction in fruit set as a result of increased embryo abortion, apparently associated with inadequate nutrition. Analyses showed a considerable reduction in total sugars in burlap-shaded trees. The effect of light intensity reduction on time of blossoming, pistil receptivity, bee activity, temperature and humidity, petal fall, and the abscission of fruits was insignificant, and no influence was noted on pollen germination, rate of pollen tube growth, and rate of embryo development.

Fruit set was materially decreased by severe defoliation.

The belief is expressed that cloudy weather alone does not decrease the normal set of cherries by affecting nutrition, and that the reduction in light intensity in the center of the tree is not sufficient to directly affect the set of fruit. The examination of developing fruits showed endosperm development to proceed more rapidly at first than did embryo development, and also that the increase in diameter of the fruit was correspondingly more rapid than embryo development until the seed reached normal size.

Seven new strawberries introduced by U.S., [I], II, G. M. Darrow (*Amer. Fruit Grower, 54 (1934), Nos. 1, pp. 11, 24, figs. 2; 2, pp. 9, 23, figs. 2*).—Blakemore, Bellmar, Southland, Redheart, Dorsett, Fairfax, and Narcissa varieties, originated by the U.S.D.A. Bureau of Plant Industry, are described and discussed with reference to parentage, environmental adaptability, and use.

Gentes Herbarum.—Art. 5, Certain northern blackberries, L. H. Bailey (*Ithaca, N.Y., 1934, vol. 3, No. 5, pp. 245–271, figs. 12*).—In this contribution (E.S.R., 70, p. 51) the author discusses the classification of the blackberries of the northern United States and proposes, on the basis of extended field and herbaria research, several new species designations for forms hitherto believed to be variations of old established species. Among new species pro-

posed and described are *Rubus bigelovianus*, *R. honorus*, *R. impar*, and *R. tennesseanus*.

Gentes Herbarum.—Art. 4, The species of grapes peculiar to North America, L. H. BAILEY (*Ithaca, N.Y., 1934, vol. 3, No. 4, pp. 149–244, figs. 35*).—Discussing and evaluating early botanical attempts to classify the native grapes, in which the species enumerated ranged all the way from 1 to 30, the author herein describes 30 species and arranges them into two subgenera, *Euvitis* and *Muscadinia*. He further divides the subgenus *Euvitis* into the groups, *Labruscoideae*, *Aestivales*, *Arachnoideae*, *Cordifoliae*, and *Vulpinae*. Of the 30 species, 6 are said to have contributed to cultivated grapes, and of these 6 only 3, *Vitis labrusca*, *V. aestivalis*, and *V. vulpina*, have been important.

New varieties of grapes, J. H. CLARK (*N.J. Agr., 16 (1934), No. 1, p. 3*).—Brief descriptive notes are given on Sheridan, Golden Muscat, Fredonia, Ontario, and other new grapes tested by the New Jersey Experiment Stations.

Wine grapes in N.J., J. H. CLARK (*N.J. Agr., 15 (1933), No. 6, p. 4*).—As a result of observations at the New Jersey Experiment Stations over a period of 10 yr. on a large number of vinifera grapes, the author groups varieties with regard to winter hardiness. Varieties which proved hardy and productive were Bellino, Chasselas Rose de Falleau, Foster, Frankenthal Precoce, Gros Sapot, Madeline Celine, Pedro Ximines, and Purple Damascus.

Blueberry fertilizer, C. S. BECKWITH (*N.J. Agr., 16 (1934), No. 1, pp. 4, 5*).—Studies by the New Jersey Experiment Stations conducted over a period of years indicated that 600 lb. per acre of a mixture of 450 lb. nitrate of soda, 450 lb. dried blood, 800 lb. rock phosphate, and 300 lb. of sulfate of potash is a desirable application for blueberries.

Cranberry fertilizer, C. S. BECKWITH (*N.J. Agr., 15 (1933), No. 6, p. 5*).—Long continued studies at the New Jersey Experiment Stations showed that for sandy soils 500 lb. per acre of a mixture of 300 lb. nitrate of soda, 300 lb. dried blood, 1,200 lb. rock phosphate, and 200 lb. sulfate of potash gave satisfactory results, both in yield and in the continued vigor of the plants.

Pollination and blooming habits of the Persian walnut in California, M. N. WOOD (*U.S. Dept. Agr., Tech. Bul. 387 (1934), pp. 56, pls. 5, figs. 15*).—Studies in California of 17 varieties of Persian (English) walnuts showed all to be self-fertile and interfertile when pollen was available. However, all 17 manifested a tendency, especially under certain environmental conditions, for the anthers and stigmas to mature at different times. In 13 of the varieties dichogamy was at times so pronounced as to prevent self-pollination. In some varieties the pistils matured earlier than the stamens and in others vice versa. The tendency to dichogamy was most marked in young trees but did not disappear altogether in very old ones. The climate, season, and weather influenced greatly the degree and character of dichogamy.

Varieties grouped naturally into early, intermediate, and late, according to their time of bloom, which though different from year to year kept the same general arrangement. The length of the blooming season of any walnut may vary from a few days in one year to upward of two months in others.

Interplanting of varieties is recommended, and certain varietal combinations are suggested. As a rule, early-blooming walnuts should be grouped with intermediates and the latter with late-blooming kinds. In fact an orchard including varieties of all three blooming groups is considered desirable. Evidence was secured that the wind carries walnut pollen effectively through several rows of trees. Stigmas were most receptive at the time stigmatic fluids were most abundant. Parthenogenesis was observed to occur in certain varieties.

Carnation studies, C. H. Connors (*N.J. Agr., 16 (1934), No. 1, p. 2*).—Sand culture studies started in 1929 at the New Jersey Experiment Stations in an attempt to overcome "sleepiness" and calyx splitting in carnations developed the fact that sand culture has practical possibilities. Not only were the carnation crops produced in sand as large and as of good quality as those in soil but the control of disease and malformations was more satisfactory.

Gladiolus culture, insects, and diseases, P. R. Krone, E. I. McDaniel, and R. Nelson (*Michigan Sta. Circ. 149 (1934), pp. 32, figs. 8*).—Prepared in three sections dealing, respectively, with culture, insects, and diseases, this paper offers a comprehensive discussion of the requirements for growing gladiolus, both for flowers and corms. In a comparison of cultivation, paper mulch, and peat mulch, the paper-mulched plants yielded the most and the earliest blooms and the peat-mulched plants the largest number of corms, both total and marketable.

A morphological study of blind and flowering rose shoots, with special reference to flower-bud differentiation, D. S. Hubbell (*Jour. Agr. Res. [U.S.], 48 (1934), No. 1, pp. 91–95, pls. 2, figs. 2*).—Observations at the Arkansas Experiment Station upon the growth and development of blind and flowering Briarcliff rose shoots showed that flower bud formation commences about 2 days later in the blind than in the flowering wood. However, in the blind shoot no stamens or pistil primordia were formed, and after 35 days the undeveloped buds aborted. Signs of abortion were noted in a few cases in about 28 days. In flowering shoots the complete formation of the flower was recorded at the end of the twenty-fifth day. The author believes that blindness is purely a physiological condition, the abortion resulting from an improper balance of nutritional factors. Citing an unpublished manuscript, the author asserts that blindness can be controlled by altering the nutrition supply.

Lightning protection for trees, J. B. Whitehead (*Science, 78 (1933), No. 2031, pp. 507, 508*).—A 7-strand bare copper conductor is led as high and as straight as possible from the base to the principal leader or leaders of the tree. For 15 in. above the upper clamp the strands are untwisted and pointed diagonally upward in all directions. The lower end of the conductor is led 11 ft. underground through an 11-ft. iron pipe to which it is also soldered. This device has perfectly protected 61 trees of various species in Maryland since 1916.—(*Courtesy Biol. Abs.*)

FORESTRY

The present condition of Connecticut forests, a neglected resource, A. F. Hawes (*Hartford: State Forester, 1933, pp. 78, pls. 2, figs. 13*).—Stating that over half the area of the State is included in forest lands and that this percentage is annually increasing, the author discusses the present condition of Connecticut forests, their ownership, types, age classes, utilization, replanting, etc.

[Forestry at the Michigan Station], P. A. Herbert (*Michigan Sta. Rpt. 1932, pp. 244, 245*).—Brief mention is made of studies on the use of paper mulch in tree nurseries, the relation of soil type to growth, and reproduction studies.

[Forest reproduction in South Carolina], E. D. Kyzer (*South Carolina Sta. Rpt. 1933, pp. 127, 128, fig. 1*).—The results are briefly discussed of investigations at the Coast Substation comparing broadcasting, spot and natural seeding, and transplanting for the reestablishment of southern pine forests, and of fire prevention in such areas by the maintenance of tilled strips.

Comparative anatomy of the woods of the Meliaceae, sub-family Swietenioideae, A. J. Panshin (*Amer. Jour. Bot., 20 (1933), No. 10, pp. 638–668, pls. 12*).—Detailed information is presented on the comparative anatomy of a large number of woods of the Meliaceae (mahogany family), as determined in studies conducted at the New York State College of Forestry at Syracuse upon specimens secured from Africa and other sources.

DISEASES OF PLANTS

The problem of acquired physiological immunity in plants, K. S. Chester (*Quart. Rev. Biol., 8 (1933), Nos. 2, pp. 129–154; 3, pp. 275–324*).—This paper is a critical analysis of the subject based on a literature review of 200 titles and on the author's own investigations. The subject is introduced with a delimitation of terminology and a priori analysis of the possibility of demonstrating acquired physiological immunity in plants. It is shown that normal, nonspecific antibodies of various types have been repeatedly observed in plants, but that their demonstration is complicated by the frequent presence in plants of substances which exert actions simulating those of true antibodies (pseudoantibodies). Artificial introduction of foreign antigenic materials into the plant has not yet been shown to be a successful method of attack, due to the insufficient data submitted, to errors due to uncontrolled or unknown variables, and to the inherent difficulties in applying to plants a technic of demonstration comparable to those of animal serology. On the other hand, the study of host parasite relationships and of symbiosis has yielded abundant evidence that the living plant opposes the aggressiveness of parasite or of symbiont with parasitic potentialities by reactions of a type fundamentally analogous to the acquired defensive mechanisms of animals. The evidence from parasitism is based on observations of resistance to reinfection, preliminary experiments in plant vaccination, and a study of morphological behavior of host in contact with a parasite, all of which lines of evidence support the thesis that acquired physiological immunity is a true mechanism of defense in plants, although the serological proof has been universally unsuccessful, supposedly because of the absence in plants of a fluid for antibody demonstration comparable to vertebrate blood. Again in symbiosis the thesis is supported by strong evidence yielded by a study of symbiont behavior in vivo, and here certain types of in vitro tests have been successfully applied in confirmation of the immune phenomena in vivo. The evidence from symbiosis is based particularly on careful studies of mycorrhizas and of the root-tubercle bacilli. Studies of the graft symbiosis have been less fruitful.

All of the evidence thus adduced implies that plants may defend themselves more or less successfully against the injurious effects of foreign bodies through the acquirement of a certain degree of specific immunity following sensitization, but such phenomena in plants differ from those in animals chiefly in the fact that acquired immunity in plants is, in general, manifested by local cellular reactions and not by any generalized humoral immunity such as plays a leading role in animal defense.—(*Courtesy Biol. Abs.*)

The oxidases in the phytopathological literature [trans. title], J. Stephan (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 43 (1933), No. 1, pp. 1–13*).—This article reviews contributions in phytopathologic literature bearing on the question of the oxidase relations in metabolic disturbances. The author warns that a number of contributions on this topic must be subjected to critical evaluation in view of the faulty technic employed in the oxidase determinations. Further studies, employing the latest available methods, are needed. Fifty-one references are cited.

Studies on bacteriophage in relation to phytopathogenic bacteria, K. S. Chester (*Zentbl. Bakt.* [*etc.*], *2. Abt., 89* (*1933*), *No. 1–4, pp. 1–30, fig. 1*).—The author reports an investigation of bacteriophage in relation to crown gall in *Pelargonium* and *Beta* caused by *Bacterium tumefaciens*, based on a study of 12,000 cultures of bacteriophage and bacteria. A considerable portion of the paper is devoted to a critical study of the technics of bacteriophage investigation in relation to phytopathogenic bacteria. The many variables adversely affecting bacteriophage demonstration are studied in detail, and from the results of this study a satisfactory standard technic is described.

In 60 tests of *Pelargonium* stems bacteriophage was isolated from 40 percent of the crown galls, from 30 percent of the healthy tissues surrounding crown galls, and from none of the healthy, noninfected plants. In 60 tests of *Beta* roots bacteriophage was isolated from 75 percent of the galls, from 40 percent of the healthy tissues surrounding the galls, and from 30 percent of plants not infected by *Bacterium tumefaciens*. These tests confirm and extend the findings of earlier workers regarding the occurrence of bacteriophage in crown galls. Tests with *Pelargonium* show also that bacteriophage is able to diffuse outward from lesions into surrounding healthy tissues, and those with *Beta* demonstrate in addition that bacteriophage from the soil can penetrate healthy root tissues, although in both cases the distance traversed is apparently limited to a few centimeters or less. The question is raised of the possible prophylactic value of such bacteriophage in healthy tissues.

Report of insect, animal, and plant disease interceptions at California plant quarantine inspection points for 1932 (*Calif. Dept. Agr. Spec. Pub. 122* (*1934*), *pp. 53*).—Brief notes are given on plant entomological and pathological interceptions, followed by a list of pests comprising over 950 species intercepted in 1932 at San Francisco, San Pedro, San Diego, border stations, and interior points.

[Plant disease studies in Connecticut] (*Connecticut* [*New Haven*] *Sta. Bul. 357* (*1934*), *pp. 122, 123, 127, 137, 138*).—Brief notes are given on studies of late blight of tomato, Dutch elm disease, chestnut blight, Stewart's bacterial wilt of sweet corn, spraying v. dusting for vegetables, white pine blister rust, and a new peach trouble characterized by a premature yellowing and ripening of the foliage.

[Plant disease studies in South Carolina] (*South Carolina Sta. Rpt. 1933, pp. 34–41, 43, 44, 49, 50, 104–106, 108, 109, 139, 140, 143–146, figs. 5*).—Results are noted of studies of tobacco downy mildew, by G. M. Armstrong, W. B. Albert, and W. M. Lunn; damping-off of cotton seedlings, by C. H. Arndt; control of fire blight infection of apple blossoms, by A. M. Musser; control of tomato leaf mold, by F. S. Andrews; steam sterilization of tobacco seed beds, by Lunn; and magnesium and potash deficiency symptoms in tobacco, by H. P. Cooper, Lunn, and H. A. McGee.

[Report of] department of mycology, E. S. Salmon and W. M. Ware (*Jour. Southeast. Agr. Col., Wye, Kent, No. 33* (*1934*), *pp. 17–27*).—This gives a seasonal survey of plant diseases, arranged by hosts, and a progress report on studies of the following: Downy mildew of the hop (*Pseudoperonospora humuli*), spraying against apple scab, pear scab (*Venturia pyrina*), virus diseases of hops, *Clitocybe dealbata* and *Xylaria vaporaria* attacking mushroom beds, fungicides, and immunity of hop varieties and selections to mold (*Sphaerotheca humuli*).

The principal diseases and pests of truck crops in Germany, 1933 [trans. title] (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 14,* (*1934*), *No. 2, pp.*

13–15, figs. 8).—A summary of the distribution and severity of the chief truck crop diseases and pests in Germany in 1933.

Observations on Lagena radicicola, J. H. L. TRUSCOTT (*Mycologia, 25 (1933), No. 4, pp. 263–265, fig. 1*).—This fungus, an obligate parasite of the roots of several cereals and wild grasses, was described in 1930 from Saskatchewan by Vanterpool and Ledingham (E.S.R., 67, p. 139), and provisionally placed in the family Ancylistaceae. In 1931–32 it was discovered in Ontario, with sporangia larger and typically branched. Until pure cultures can be made, however, no attempt is made to separate the two taxonomically.—(*Courtesy Biol. Abs.*)

New mercurial and tannic fungicides [trans. title], O. VERONA and G. BRUSCHI (*Bol. R. Ist. Super. Agr. Pisa, 8 (1932), pp. 197–213*).—The action of several mercurial and tannic fungicides was determined on bacteria, fungi, and vegetables.—(*Courtesy Biol. Abs.*)

Cupric spray mixtures with alum added [trans. title], R. ROUAYROUX (*Prog. Agr. et Vitic., 50 (1933), No. 2, pp. 36–38*).—The author, noting divided opinion on the value of alum in cupric spray mixtures used against grape mildew, determined by experiment the chemical and physical characteristics of a copper mixture (2 kg $CuSO_4$+1 kg Na_2CO_3 in 1 hl water) to which 2 kg potash alum was added. He concludes that the action of the alum depends on an equilibrium reaction involving double decomposition and producing basic aluminum sulfate, that the more basic the original mixture the less copper enters into the reaction, that the aluminum sulfate produces a finely divided colloidal precipitate which dries out partially on exposure but gels again in contact with water, that the resultant mixture is very adherent, and that it spreads well.—(*Courtesy Biol. Abs.*)

Burgundy mixture, O. BUTLER (*New Hampshire Sta. Tech. Bul. 56 (1933), pp. 26*).—Employing ratios of copper sulfate and crystallized sodium carbonate ranging all the way from 1:0.9 to 1:1.84, the author concludes that a 1:1 Burgundy mixture meets satisfactorily all the requirements of spraying practice. Mixtures made with ratios between 1:1.15 and 1:1.5, commonly used in practice, were found much less stable than mixtures made with the ratio of 1:1 and 1:1.84. Within the ratio range utilized, the largest amount of soluble copper in freshly made Burgundy mixture was found in the 1:1 ratio. However, upon drying, this ratio contained the least soluble copper; in fact after drying, acid, neutral, and alkaline mixtures differed but little in composition. The percentage of soluble copper in dried Burgundy mixtures made within the range 1:0.9 and 1:1.84 was below the tolerance limit of plants accepting copper sprays.

Made with a ratio copper sulfate to sodium carbonate of 1:1.84 and stabilized with 0.01 percent tartaric acid or 0.02 percent citric acid, Burgundy mixtures contained soluble copper in amounts less than 0.005 percent. Burgundy mixtures stabilized with sodium arsenite contained arsenic in solution. The addition of acid lead arsenate reduced but slightly the percentage of soluble copper in the wash, whereas calcium arsenate reduced soluble copper materially.

Gibberella saubinetii (Mont.) Sacc. on British cereals, II, III, F. T. BENNETT (*Ann. Appl. Biol., 18 (1931), No. 2, pp. 158–177, pls. 3, figs. 2; 20 (1933), No. 3, pp. 377–380, fig. 1*).—This continues previous work (E.S.R., 70, p. 792).

II. *Physiological and pathological studies*.—Under storage conditions *G. saubinetii* retains its vitality for at least 2 yr. in its vegetative stage, and for at least 1 yr. (probably much longer) in its perithecial stage. Heating to 100° C. for 5 min. under dry conditions kills the fungus on or in diseased grains,

but this treatment of seed grain is not a practicable way of controlling the disease. *G. saubinetii* causes "seedling blight" and "foot rot" of cereals but is much less virulent than *Fusarium culmorum* and *F. avenaceum* in this respect. All three fungi attack the ears similarly, with equal virulence and with similar results.

G. saubinetii occurs throughout England and in Ireland, but full details of its frequency of occurrence in the British Isles have not yet been obtained. The fungus, the conidial stage of which is known as *F. graminearum*, produces mature perithecia on natural and artificial substrata when given ample moisture and a uniform temperature of from 21° to 22°. British summer shade temperature does not suffice for this. The minimum temperature for germination of conidia and ascospores is about 5°. Between 5° and 10° both kinds of spores develop mycelia, and the fungus can infect cereal seedlings. The optimum temperature for vegetative growth and the production of mature perithecia is about 24°, and the maximum temperature for growth is about 37°. In its vegetative and perithecial stages this fungus can withstand prolonged exposure to from —1° to —20°, and in its vegetative stage it persists through the winter in Great Britain.

III. *Occurrence under natural conditions.*—The perithecial stage was found on wheatears under field conditions in 1932, this being the first report of its occurrence in England under natural conditions. The meteorological conditions of this year are compared with those of 1929, when perithecia were not developed outdoors. The high temperatures of the summer of 1932 are concluded to have been chiefly responsible for development of the perfect stage.

Notes on growth types shown by this fungus in single ascospore cultures are included. The *Fusarium* type is normal, but the ascigerous type may arise from ascospores developed under abnormal circumstances.—(*Courtesy Biol. Abs.*)

Influence of soil temperature and soil sterilization on the reaction of wheat seedlings to Ophiobolus graminis Sacc., A. W. HENRY (*Canad. Jour. Res., 7 (1932), No. 2, pp. 198–203, pl. 1, figs. 2*).—Marquis wheat seedlings reacted similarly to a virulent Alberta strain of *O. graminis* in soil steam sterilized 4 hr. at 15 lb. and in unsterilized soil when grown at low temperatures, but differently at higher temperatures. At 13° C., for instance, the blighting was about equally severe in sterilized and unsterilized soil, but at 27° most of the seedlings were killed in the sterilized soil while those in the unsterilized soil were only slightly attacked. The protective value to wheat of the constituents of unsterilized soil against soil-borne inoculum appears, therefore, to vary with temperature, being under the conditions of these studies relatively slight at soil temperatures below 20°.

A study on the relation of environment to the development of the uredinial and telial stages of the physiologic forms of Puccinia graminis avenae Erikss. and Henn, W. L. GORDON (*Sci. Agr., 14 (1933), No. 4, pp. 184–237, pls. 5, figs. 19*).—Nine physiologic forms of *P. graminis avenae* were isolated from 1,070 collections of oat stem rust in Canada during 1925–30. These are forms 1, 2, 3, 4, 5, 6, 7, 8, and 9. During 1931 forms 6 and 7, yellow in color, were isolated from cultures obtained from a barberry which had been artificially inoculated. Of the 1,257 isolations made in Canada during the period mentioned, 1,213, or 93.5 percent, consisted of forms 1, 2, and 5.

It is shown that the temperature at which the hosts Victory, White Russian, Richland, and Joanette Strain are grown prior to inoculation in the seedling stage has no appreciable effect on the types of uredinial infection produced on them later by forms 1, 2, 3, 4, and 5. No significant changes were produced

by forms 2, 6, 7, 8, and 9 on the hosts Victory, White Russian, Richland, and Joanette Strain. Similarly, no appreciable differences due to temperature were observed in the types of uredinial infection produced by forms 1, 3, 4, and 5 on the hosts Victory, White Russian, and Richland. The types of uredinial infection produced by forms 1, 3, 4, and 5 on the differential host Joanette Strain were profoundly changed by temperature.

To obviate the necessity of maintaining accurately controlled temperatures while the identification of the physiologic forms present in a large number of collections of oat stem rust is in progress, the following grouping of the forms, distinguishable only on Joanette Strain at a low temperature, is suggested: Group I, forms 1, 2, and 5; Group II, forms 3 and 7; and Group III, forms 4 and 6.

Temperature has been shown to be an important factor in the formation of teliospores in *P. graminis avenae*. All the physiologic forms developed teliospores more rapidly on both seedlings and mature plants at relatively high (24° to 28° C.) than at low temperatures (12° to 16°). Forms 3, 4, 6, 7, 8, and 9 were found to form teliospores much more rapidly than forms 1, 2, and 5. Since the former group of physiologic forms is more virulent than the latter, a correlation between pathogenicity and rapidity of teliospore formation is indicated. It is suggested that the rarity of forms 3, 4, 6, 7, 8, and 9 in Canada may be due to the early development of telia. Thus the uredinial period is reduced and, as a consequence, the amount of inoculum is greatly diminished. The stage of development of the host was not shown to be a limiting factor in the formation of teliospores by any of the physiologic forms.

A high relative humidity (80 percent) was found to increase both the extent and the rate of telial development on seedlings, while the rate of telial development on mature plants was slightly increased by a low relative humidity (40 percent).

Ultraviolet radiation produced no significant changes in the uredinial or telial development of the physiologic forms.

Contribution on the biology of the species of Puccinia which attack wheat in Rumania [trans. title], T. SĂVULESCU (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 43 (1933), No. 10, pp. 577–594, figs. 4*).—*P. triticina* overwinters in Rumania both as urediospores and mycelium. Infections of fall-sown wheat, followed by a mild winter, frequently produce early and severe epiphytotics in the spring. After severe winters the rust appears later and is then attributed to wind-borne spores brought chiefly by east, south, and southwest winds. The aecial form has not been found on *Thalictrum* species, although four native species have been rusted artificially, namely, *T. flavum*, *T. aquilegifolium*, *T. bauhini*, and *T. minus*. *P. glumarum* does not overwinter. It commonly appears later than *P. triticina* (in June) and is attributed to spores brought in by north, northwest, and west winds. *P. graminis* does not overwinter except in the teliospore stage. The sources of infestation are aeciospores from local barberries and urediospores brought from a distance by south winds.

Crop injury by stem rust of wheat in Germany, 1932 [trans. title], M. KLEMM (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 14 (1934), No. 2, pp. 9–11, fig. 1*).—A summary of the distribution and severity of stem rust attack on winter wheat and spring wheat in Germany in 1932 in comparison with the average for the period from 1924 to 1931, inclusive.

Factors affecting the severity of take-all.—I, The importance of soil micro-organisms, S. D. GARRETT (*Jour. Dept. Agr. So. Aust., 37 (1934), No. 6, pp. 664–674, figs. 2*).—Epidemics of take-all in South Australia are practically confined to light sandy soils of the mallee areas during the first 20–30 yr. of

cultivation. On older mallee soils and on heavier clay-loam soils of the Adelaide Plains and Lower North wheat-growing areas, severe attacks of take-all occurred only under exceptional conditions, such as follow plowing in of infected grass or stubble. Laboratory and field experiments showed that infection of the roots of wheat seedlings by *Ophiobolus graminis* is very much more rapid in the lighter soils. Difference in growth rate of the fungus in these two classes of soils was completely eliminated by soil sterilization, suggesting that the biological antagonism of micro-organisms in heavier soils was responsible for retarding infection. Counts of bacterial numbers supported this conclusion, as did an experiment in which addition of poultry manure to sand greatly retarded the progress of infection. Differences in infection were not due to differences in resistance of the plants, as was shown in an experiment with widely different conditions of nutrition where no effect on the progress of infection along the roots of wheat seedlings was noted.

It is suggested that the gradual decrease in prevalence of take-all on the light sandy soils of the mallee areas, with progress of cultivation, is due chiefly to increase in their organic content. Measures hastening this process are therefore recommended. A quantitative method for estimating *O. graminis* infection under different soil conditions by means of direct measurement of hyphal growth down the roots of wheat seedlings is described.

A preliminary note on an unreported rootrot of oats, G. B. Sanford (*Sci. Agr., 14 (1933), No. 1, pp. 50, 51, pl. 1*).—This malady, which occurs in central Alberta, Canada, is most pronounced on oat plants before the secondary root system is established, after which affected plants tend to recover. The lower leaves turn brown and wither, and the plants are stunted. In this respect the symptoms on the foliage resemble the "browning" disease of cereals, but *Pythium* spp. are not associated. Constantly associated with the early symptoms are very small, dark brown, sclerotium-like masses of a fungus firmly attached to the tissue of the mesocotyl and the primary roots.

The pathogenicity or identity of the causal fungus has not been established.

Mechanical injuries to roots and corms of abaca in relation to heart-rot disease, M. M. Ramos (*Philippine Agr., 22 (1933), No. 5, pp. 322–337*).—Heart rot of *Musa textilis* occurs on weakened plants. A soil-inhabiting fungus, *Fusarium moniliforme subglutinans* is associated with the disease, but artificial inoculations were successful only when the plants were kept in a moist chamber. They recovered in from 35 to 40 days when given out-of-door conditions.

Plants growing in nature and affected with bunchy top showed from 10 to 22 percent of heart rot. Plants affected with root weevil showed from 53 to 90 percent of heart rot, and plants affected with nematodes showed from 9 to 20 percent. Cutting off portions of the roots weakened the plants and predisposed them to heart rot infection.—(*Courtesy Biol. Abs.*)

Alfalfa yellows, L. F. Graber and V. G. Sprague (*Science, 78 (1933), No. 2033, p. 556*).—A brief reference is given to entomological evidence in support of conclusions by the authors previously noted (E.S.R., 70, p. 639).—(*Courtesy Biol. Abs.*)

Grease spot disease of beans [trans. title], K. Böning (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz, 11 (1934), No. 2, pp. 265–269, fig. 1*).—This disease, caused by *Pseudomonas medicaginis phaseolicola*, was first observed on beans in a München (Munich) market garden in 1931, and by 1933 it had spread to several establishments.

A description of the disease and discussion of control practices are given.

On the so-called "vaiolo" of cauliflower [trans. title], O. Verona (*Bol. R. Ist. Super. Agr. Pisa, 8 (1932), pp. 291–299, figs. 3*).—*Alternaria* causes a

change in the inflorescence of cauliflower. Cases of the disease called "eziologia multipla" are presented to describe this change.—(*Courtesy Biol. Abs.*)

Dry rot (fusariose) of corn in the foothill region of North Caucasus [trans. title], Z. S. CHERNETSKAIA (TSCHERNETZKAYA) (*Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant Breeding*), *2 ser., No. 3* (*1932*), *pp. 3–61, pl. 1, figs. 9; Eng. abs., pp. 56–59*).—In the foothills north of the Caucasian Mountains dry rot of corn appeared only recently, 1929, with the introduction of the American variety Ivory King. The work shows that local varieties are susceptible to dry rot, which had been found more abundant near the fields planted to Ivory King.

The author's studies indicate that dry rot is caused by *Fusarium moniliforme*, and that the varieties Ivory King, White Tersk, and Sixty Days are the most susceptible while Brown County and Sterling are the most resistant to dry rot. He considers that the territory is very favorable for dangerous development of the disease and, therefore, strongly recommends methods of prevention and control, notably the growing of resistant varieties and use of seed from dry rot.—(*Courtesy Biol. Abs.*)

The influence of environmental conditions on the development of the angular leaf-spot disease of cotton [I]–V, R. H. STOUGHTON (*Ann. Appl. Biol.*, *15* (*1928*), *No. 3, pp. 333–341; pl. 1, figs. 3; 17* (*1930*), *No. 3, pp. 493–503; 18* (*1931*), *No. 4, pp. 524–534 pl. 1, figs. 3*; *19* (*1932*), *No. 3, pp. 370–377, figs. 2; 20* (*1933*), *No. 4, pp. 590–611*).—Four papers are given.

[I]. Experiments on the conditions governing the development of angular leaf spot (*Bacterium malvacearum*) in young cotton plants, chiefly of the Ashmouni variety, are reported. In each experiment from 2 to 6 plants were sprayed with a suspension of *B. malvacearum* and placed in the infection chamber for 48 hr., then removed to the greenhouse. A detailed description of the infection chamber is given. In one group of the sprayed plants slight infection occurred at 32° C. and no infection above that temperature in a relative humidity of 80 percent. The second group at 28° showed slight infection when the relative humidity of the chamber was 70 percent and no infection at 65 percent.

II. *The influence of soil temperature on primary and secondary infection of seedlings.*—Naturally infected cottonseed delinted with H_2SO_4 and treated with $HgCl_2$ solution was grown in comparison with artificially infected seed and with untreated naturally infected seed in soil regulated to a range of temperature while the air temperature was kept uniform in automatically controlled closed chambers. Seed derived from diseased plants may give rise to infected seedlings, but *Bacterium malvacearum* is carried only on the outside of the seed and on the fuzz. Thorough disinfection of the exterior of the seed resulted in healthy plants. The amount of primary infection resulting from infected seed decreased with rise of soil temperature above 30° C., but infection was not inhibited at 40°. Copious seedling infection occurred at 15°, the lowest soil temperature employed. Soil temperature had little or no effect on secondary infection. Plants diseased in the seedling stage outgrow the disease if no further inoculation occurs. No evidence of internal seed infection or systemic infection was disclosed.—(*Courtesy Biol. Abs.*)

III. *The influence of air temperature on infection.*—Experiments show that high air temperature favors the development of the disease. Maximum infection occurs at an air temperature of from 35° to 36° C., with decreasing incidence at progressively lower temperature. At a constant air temperature of from 39° to 40° cotton plants make no growth and eventually die. Infection takes place more readily when the inoculation is carried out during the

nonilluminated period. The relation of these results to the experiments on the influence of soil temperature is discussed.

IV. *The influence of atmospheric humidity on infection.*—Six Rothamsted control chambers were maintained at different constant humidities (50–90 percent), with the same air temperature and soil temperature in all. Young cotton plants (Sakellarides variety) were kept in the chambers for a few days and then sprayed with a suspension of *Bacterium malvacearum*. Under favorable temperature conditions the greatest amount of disease was found to occur at relative humidities exceeding 85 percent. Below this the degree of infection decreases rapidly with increasing dryness of the atmosphere.

The relation of these results to experiments on the influence of air temperature is discussed, with the conclusion that the influence of humidity is mainly physical in nature by affecting the time during which the infection droplets persist.

V. *The influence of alternating and varying conditions on infection.*—These experiments, which conclude the series, show that regular short-term fluctuations in soil and air temperature produce the same effect on the disease as a constant temperature near to the mean of the variations. The mean soil temperature for the first few days of germination is the chief controlling environmental factor in the incidence of primary infection. The amount of primary infection varies also with the type of soil and its moisture content. Air temperature is of importance throughout the incubation period, while the effect of air humidity is limited to a short time after inoculation. Plants kept in total darkness are relatively resistant to infection, while those grown in continuous light are no more susceptible than those under a daily period of 17 hr. illumination.—(*Courtesy Biol. Abs.*)

Effect of hydrocyanic acid gas on cucumber plants previously sprayed with copper fungicides, E. F. Guba and E. B. Holland (*Massachusetts Sta. Bul. 303 (1933), pp. 16, figs. 5*).—This investigation sought to analyze the cause of the injury occurring when cyanide fumigation follows the application of copper fungicides in the treatment of greenhouse crops. A long series of Bordeaux mixture formulas was compared as to capacity for inducing injury. They ranged from acid and neutral to strongly alkaline (4:24:50). Copper sprays prepared with milk of lime, filtered limewater, and chemical hydrated lime were also compared. A number of proprietary copper sprays were included in the study, as well as basic copper sulfates, copper carbonates, ammoniacal copper carbonate, Burgundy mixture, caustic soda, Bordeaux mixture, normal copper acetate, basic copper acetate, copper sulfate alone, and hydrated lime alone.

Cucumbers in pots were used as test plants. From 8 to 130 hr. after the spray applications, either calcium or sodium cyanide at standard concentration was employed for fumigation, which began from 1 to 2 hr. after sundown. At no time was the foliage of the treated plants wetted. Records of injury were usually made from 3 to 6 days after exposure to the gas. Potassium ferrocyanide tests for the presence of soluble copper were applied to washings from treated foliage following fumigation. To determine whether toxic products might be formed in the spray residue without the influence of the foliage itself, glass plates were sprayed with various Bordeaux mixture formulas, exposed to HCN fumigation over night, and the spray residue tested for soluble copper as well as HCN.

The results showed that foliage injury followed either method of HCN gas treatment with all the sprays used except the copper carbonates, ammoniacal copper carbonate, commercial basic copper sulfates, copper sulfate (0.01 to 0.07 percent copper), hydrated lime alone, and an alkaline commercial spray

with low copper content. The presence of free lime or soda in the copper spray increased the danger of injury, but injury could also occur without free alkali, as in the case of acid Bordeaux mixtures, the copper acetates, and copper fungicides prepared by adding alkali just sufficient in amount to yield mixtures neutral to litmus. Spray residue from injured leaves and Bordeaux mixture residues on glass, acted on by gas, yielded water-soluble copper, the amount tending, in general, to increase in proportion to the amount of alkali present within the limits of ordinary spray ratios. The toxic salt is presumed to be calcium cuprocyanide or similar soluble copper salt of cyanide.

The author concludes that where copper fungicides are necessary in greenhouse practice, they should be applied after fumigation, or else only commercial basic copper carbonates, basic copper sulfates, or nonstaining ammoniacal copper sprays should be used.

Septoria leaf spot disease on peppermint [trans. title], M. WALTER (*Heil u. Gewürz-Pflanzen, 15 (1933), No. 3, pp. 93, 94, fig. 1*).—The author reports a leaf spot disease of peppermint (*Mentha piperita*) due to *Septoria menthae*, apparently not hitherto observed in Germany except on *M. arvensis*.

Some virus diseases of the potato and other farm crops, K. M. SMITH (*Scot. Jour. Agr., 16 (1933), No. 4, pp. 446–456, pls. 3, figs. 2*).—A general review is given on virus diseases of potatoes and on the four species of aphids attacking potatoes in Great Britain—*Myzus persicae*, the most important vector of potato viruses; *M. pseudosolani*, which is an occasional vector; *Macrosiphum gei*, considered by workers in other countries to be a vector, but failing to transmit in experiments at Cambridge; and *Aphis rhamni*, which does not appear to be a vector.

Brief introductory remarks are given on viruses in general, and on virus diseases of other crop plants and their relations with insects.

Observations on potato blight (Phytophthora infestans) in relation to weather conditions, M. E. NAPPER (*Jour. Pomol. and Hort. Sci., 11 (1933), No. 3, pp. 177–184*).—This paper treats of investigations on *P. infestans* conducted along the lines previously followed in the author's researches on *Cystopus candidus*. A partial drying of the conidia of *P. infestans* is necessary for germination, but the required loss of water content is less and of wider range than in *C. candidus*. Conidia production and mycelial growth depend upon the water content of the host tissue. Weather factors are important in spreading the disease. A reduction in water content of the spores is accomplished by sunshine and drying winds following the production of conidia. Rains or heavy dews are favorable to the germination of the spores. A high water content of host tissues is brought about during periods of heavy rainfall with moderate temperature and the absence of strong winds. Repetition of the sequence of dry and wet weather favors epidemic forms of the disease. The incubation period of infestation was found to be 4 or 5 days in the older leaves, and longer in the younger leaves.

It is suggested that varietal resistance to potato blight is due to the water content of the foliage and of tuber tissues being lower in resistant varieties than in susceptible varieties grown under the same conditions. Infestation occurs in resistant varieties when prolonged wet weather brings the water content of the resistant varieties up to a point favorable for the growth of the fungus.—(*Courtesy Biol. Abs.*)

Historical notes on the leaf roll of potatoes, R. L. SCARLETT (*Scot. Jour. Agr., 16 (1933), No. 4, pp. 481–486*).—A review of early contributions by British writers.

The meteorological conditions which permit infection of potatoes by Phytophthora infestans [trans. title], J. DUFRENOY (*Assoc. Franç. Avanc.*

Sci., Compt. Rend., 56 (1932), pp. 250, 251, fig. 1).—A hygrothermographic and precipitation record for the first week in June 1932 taken in a potato field at Libourne (Gironde, France) is presented and interpreted in terms of the appearance of late blight spots on potato foliage. Nights with temperatures above 10° C., accompanied by prolonged dew or rain and followed by rainy or dense foggy days resulted in infections.

Potato seed treatment tests, E. J. Wheeler and H. C. Moore (*Michigan Sta. Spec. Bul. 246 (1933), pp. 19, figs. 5*).—Tests extending over 6 yr. were conducted on five different farms for the purpose of comparing corrosive sublimate, hot formaldehyde, calomel, acidulated mercury, and four commercial organic mercurials and various treatment periods. Seed tubers from the same source were used in each test. About 75 percent of these tubers carried scab and black scurf lesions. The tests were conducted on soils that were not known to be free from these diseases, and perhaps as a result of this, satisfactory control of scab (*Actinomyces*) was not obtained in these tests with any of the treatments. Somewhat more distinct control of scurf (*Rhizoctonia*) was obtained, no other treatment appearing superior to the half-hour soak in corrosive sublimate solution (4 oz. in 30 gal.).

In general, less scab and scurf were found in the crop from untreated, scab- and scurf-free seed selected from the test lots than from any of the treated lots. The 5-min. calomel-corrosive sublimate soak and the acidulated corrosive sublimate treatments gave results averaging at least equal to the longer corrosive sublimate treatments. The 1½-hr. corrosive sublimate treatment did not give significantly different results from the half-hour soak. Adding 1 oz. of this material to each 30 gal. after treating each two lots of seed potatoes resulted in the solution getting stronger with use.

Soil treatment tests indicated possibilities which need further investigation.

Sugar beet growing in Belgium in 1932 [trans. title], L. Decoux, J. van der Waeren, and G. Roland (*Inst. Belge Amélior. Betterave Pubs., No. 6 (1933), pp. 267–283, figs. 6; Dutch abs., p. 283*).—The year 1932 produced poor beets (15.57 percent average sugar content), and *Cercospora beticola*, *Pegomyia hyoscyami*, a damp autumn, and excessive nitrogen fertilization are supposed to be the causes. That year's weather was noted for a lack of water from April to August and an excess from September and October.

Among the parasites causing damage, the following are cited: *C. beticola*, *P. hyoscyami*, and black foot ["pied noir"] caused by *Phoma betae*. *Sminthurus luteus*, having caused damage to young plants, was the object of special study.

Viruses of the sugar beet [trans. title], G. Verplancke (*Inst. Belge Amélior. Betterave Pubs., No. 6 (1933), pp. 231–248, figs. 8; Dutch abs., pp. 247, 248*).—Mosaic and yellows are the virus diseases of beets found in Belgium. A cytological study of the diseased tissues showed the usual tissue changes caused by viruses. These viruses are effectively transmitted by rubbing and by leaf wounds. The following insects were proved to be successful vectors: *Doralys fabae*, *Myzus persicae*, and *Aulacorthum pelargonii*. The quantity of inoculated virus plays no part in the intensity of the symptoms induced by inoculation. Several other hosts of the viruses were established and are listed. The passage of the virus through these hosts has no effect on its virulence. These diseases are transmitted by seed, but not through the soil. They are easily transmitted by grafting. High temperature brings about no masking of mosaic symptoms. The viruses of turnips, *Rumex crispus*, chicory, and carrot are very similar to those of beets; those of beans are essentially different. Varietal resistance in beets to these viruses was not found.

Nitrogen fertilizers seem to augment the incidence of these diseases, and attention is drawn to the importance of using healthy seed.

A new disease of cane in north Queensland, A. F. Bell (*Queensland Agr. Jour., 40 (1933), No. 6, pp. 460–464, figs. 3*).—This disease was previously reported (1929) in Queensland as "pseudoscald." An apparently identical condition has been reported from Java as "fourth disease" and in Hawaii as "chlorotic streak." What is apparently the same trouble occurs also in Puerto Rico, along with true leaf scald. In experiments by the author, 14 of 16 untreated stools bore these leaf symptoms, while not a single streak was ever observed in the stools arising from the warm-water-treated cuttings. Warm-water treatment for 20 min. at 52° C. enabled the plants to throw off the disease. Throughout their whole life the stools from warm-water-treated cuttings maintained a much more rapid rate of growth than the untreated ones, and when harvested at 12 mo. the former greatly outyielded the latter.

The origin of this disease is not known, but its wide-spread distribution proves that it has been in Queensland for many years. The means by which it is spread from diseased to healthy plants is not yet known. Observations made so far indicate that the rate of spread is slow, and that if healthy planting material is used it is all that is necessary to control the disease in most cases.

Control of downy mildew disease of tobacco through temperature regulation, E. E. Clayton and J. G. Gaines (*Science, 78 (1933), No. 2035, pp. 609, 610*).—*The disease caused by Peronospora hyoscyami attacks seedlings in the beds. It is found that relatively high temperatures check disease spread by preventing sporulation and by checking development of the fungus in the host tissues, at least during the period when the plants are almost large enough to set in the field. Small seedlings are not protected so effectively, and the White Burley variety is probably not protected at all.*—(*Courtesy Biol. Abs.*)

Watermelon susceptible to Texas root rot, J. G. Brown (*Science, 78 (1933), No. 2031, p. 509*).—Several varieties of *Citrullus vulgaris*, previously thought resistant or immune to the disease caused by *Phymatotrichum omnivorum*, have been proved susceptible to inoculation by pure cultures and to attack when grown in infested soil in Arizona. When the inoculations were made with certain mixed cultures, the second organism inhibited the infection by its action on the parasite.—(*Courtesy Biol. Abs.*)

Recent results of spraying experiments against fungus diseases of fruit trees [trans. title], I. Jørstad (*Selsk. Havedyrkning. Venner Medlemsskr., 10 (1932), No. 2, pp. 59–65*).—In Norway lime-sulfur has proved wholly unsatisfactory against pear scab, but in recent experiments 3 applications with various types of Bordeaux mixture, viz, just before and after blossoming and from 1 to 1¾ mo. afterward, have usually given excellent results, and mostly without spray injury to the fruit. The application just before blossoming was the most important one, but all 3 applications were necessary to get the best possible result, which in the variety Grev Moltke varied from 58 to 92 percent quite clean fruit against from 0 to 18 percent for the untreated trees. Spraying with Bordeaux mixture also gave, in combination with pruning, promising results against pear canker (*Nectria galligena*), which is a most serious disease to pears in western Norway.

Although more effective than lime-sulfur also against apple scab, Bordeaux mixture cannot safely be applied to many apple varieties as serious spray injury may result. Promising results were obtained with Bordeaux mixture a week before blossoming, followed by the 3 usual lime-sulfur applications. Two sprayings with Bordeaux mixture, viz, before and after blossoming, has controlled *Clasterosporium carpophilum* on cherries quite well.

As a whole, "white" Bordeaux mixture containing twice as much lime as copper sulfate has not proved more satisfactory than the usual Bordeaux mixture.—(*Courtesy Biol. Abs.*)

Brown rot of cherries, S. FISH (*Jour. Dept. Agr. Victoria, 31* (*1933*), *No. 12, pp. 608, 618, figs. 2*).—A report is made on this disease as it occurs in Victoria, including factors favoring infection and control recommendations for Victorian conditions.

Peach canker investigations.—I, Some notes on incidence, contributing factors, and control measures, R. S. WILLISON (*Sci. Agr., 14* (*1933*), *No. 1, pp. 32–47, figs. 8*).—Intensive surveys were conducted annually in a peach orchard planted at St. Catharines, Ont., in 1928 and subdivided into plats receiving different cultural and spray treatments. Cankers or dead bark areas were observed to originate at dead twigs, pruning wounds, and other injuries of various kinds, and killing back of callus tissues subsequently formed were found to result in perennial extensions of the lesions. Twig lesions associated with brown rot of the fruits (caused by *Sclerotinia* sp.) proved no more subject to canker than mechanical injuries. Spraying did not effectively control the disease. The incidence of canker was markedly increased in trees overstimulated by certain cultural practices, such as prolonging the period of open cultivation. Pruning wounds made during the dormant season became cankered more readily than those made during the growing season. Pruning stubs were much more vulnerable foci of infection than close-pruning wounds.

A number of suggestions for prevention of canker are enumerated.

Effects on apple-trees of lime sulphur following Bordeaux mixture, G. H. CUNNINGHAM (*New Zeal. Jour. Agr., 48* (*1934*), *No. 1, pp. 15–17*).—Experimental results, while not conclusive, were sufficiently definite to indicate that no injury follows applications of a Bordeaux mixture or $CuSO_4$ plus lime-sulfur combination, provided the lime-sulfur is not in excess. Approximately 3 lb. of $CuSO_4$ are required to precipitate completely the polysulfides in 100 gal. of 0.1 percent lime-sulfur. Consequently, soluble copper compounds are not formed when 3:4:50 Bordeaux mixture is combined with 0.2 percent lime-sulfur. Injury is not likely to follow when apple trees are sprayed with either 5:4:50 or 3:4:50 Bordeaux mixture at the green tip and followed at the pink or prepink stage with 0.2 percent lime-sulfur.

Apple spraying and dusting experiments, 1928 to 1932, in relation to scab, yield, and tree growth, D. FOLSOM (*Maine Sta. Bul. 368* (*1933*), *pp. 417–501, pls. 4, figs. 8*).—This bulletin gives the results of a 5-yr. continuation of the apple spraying experiments in Maine reported in 1928 (E.S.R., 61, p. 540). The object was to find a means of controlling apple scab without damage from spray injury. The usual spray schedule included 2 preblossom and 4 postblossom applications put on with spray guns at 300-lb. pressure or better. Dry lime-sulfur 4 lb. to 50 gal. used throughout the season was the standard basis of comparison with other materials. Lead arsenate at the rate of 1 lb. to 50 gal. was added where necessary for codling moth control. The principal tests were conducted on 39 bearing McIntosh trees. A newly planted McIntosh orchard of 450 trees was also used to study the effects of various spray materials on foliage scab, foliage injury, and diameter growth of the trunk. The results of all tests were treated by statistical methods to establish their significance.

In these tests two kinds of "flotation" sulfur sprays, Bentonite (Kolo) sulfur spray, sulfur dust, sulfur plus dry lime-sulfur dust, calcium monosulfide spray, and iron sulfate added to dry lime-sulfur spray were used as substitutes for dry lime-sulfur in the postbloom applications. None of them proved as effective in scab control as the standard material.

Less fruit and foliage injury followed the use of most of the substitutes, but this advantage was, in general, so much offset by poorer scab control that the author is led to the tentative conclusion that the lime-sulfur spray throughout the season continues to deserve preference from the grower's standpoint. It apparently made little difference in stem growth what kind of spray or dust was used, or, indeed, whether or not any was used. Dormant sprays did not prevent spread of scab from infected twigs. The August application appeared to reduce storage scab to a negligible amount.

A tabular digest is presented of the results of recent experiments in 12 States and 2 Canadian Provinces with substitutes for lime-sulfur in apple scab control. One hundred and forty references are cited.

Apple scab, W. H. Martin (*N.J. Agr., 16 (1934), No. 1, pp. 3, 4*).—Apple scab was more prevalent in New Jersey in 1933 than in previous recent years. Early and frequent spring ascospore discharge and more abundant rainfall than usual account for the increase. Even under conditions exceptionally favorable to the disease, experimental sprayed blocks at Shiloh showed only 3 percent severe scab where unsprayed controls showed 86 percent severe scab.

Reasons are suggested for growers' failures to hold down scab.

Breeding for Plasmopara resistance in grapes [trans. title], B. Husfeld (*Gartenbauwissenschaft, 7 (1932), No. 1, pp. 15–92, figs. 57*).—Technic is given relating to artificial infection and successful wintering over of *Plasmopara* on green leaves. So far no biological specialization has been observed. Reference is made to an economic method for the testing of large numbers of grape seedlings. American and European species of grapes show $2n = 38$ chromosomes, and in 2 selfed plants occurred $2n = 40$ chromosomes. In resistant plants affected cells and tissues die off quickly, and there is an increase in chlorophyll and anthocyanin in the cells surrounding infection centers. The mycelium grows remarkably weaker in the leaves of resistant plants as compared with those showing no resistance. Success appears possible only by the crossing of European high quality grapes with resisting American grapes.—(*Courtesy Biol. Abs.*)

Banana leaf spot.—Progress report, J. H. Simmonds (*Queensland Agr. Jour., 39 (1933), No. 1, pp. 21–40, figs. 4*).—This report discusses various field and laboratory experiments designed for the control of banana leaf spot (*Cercospora musae*). Dusting with copper carbonate with and without sulfur proved ineffective, as did the periodical stripping off of affected leaves. Treating the planting material with various fungicides did not appear to delay the subsequent development of the disease.

The identity of the causal organism with *C. musae* is confirmed. No form of fructification could be obtained in culture.

Field observations and laboratory experiments on the temperature relationships of the causal organism showed that for the epidemic development of leaf spot it appeared necessary to have a period of three consecutive days having a high relative humidity accompanied by rain. This explains the severity of the disease in the late summer and autumn months.

Conditions other than leaf spot contributing to loss of leaf are briefly referred to. Amongst these are unsatisfactory soil and situation and two other leaf diseases, namely, leaf speckle and yellow leaf spot. The former appears as a grayish speckling on the under surface of the lower leaves. The cause is uncertain. The latter is a large yellow elliptic or diamond-shaped spot and is probably due to the presence of *Scolecotrichum musae*.—(*Courtesy Biol. Abs.*)

Stomata spots on ripening bananas [trans. title], W. F. VAN HELL (*Landbouwk. Tijdschr. [Amsterdam], 46 (1934) No. 555, pp. 16–29, figs. 7; Eng. abs., p. 29*).—During the ripening of some banana varieties (Congo, Dwarf, Gros Michel) there appeared on the skin small brown, somewhat sunken spots which originate around the stomata. They are not due to fungus or bacterial infestation, but result from a physiological disturbance. In apples and Mangga gedong a similar disease has been described. Following M. W. Kidd and A. Beaumont, who gave the disease in apples the name "lenticel spot", the author proposes for the banana disease the name "stomata spot", the spots taking their origin around the stomata.

Prevention must be sought in conditions during growth, transport, and ripening of bananas. Experiments along this line are in progress.

Bacteriosis (blight) of the English walnut in California and its control, B. A. RUDOLPH (*California Sta. Bul. 564 (1933), pp. 88, figs. 17*).—In addition to presenting the results of his own observations and control experiments on this bacterial disease of walnut under California conditions, the author carefully summarizes existing knowledge in regard to its history and world distribution, its effects, the characteristics and behavior of the causal organism, the manner of dissemination, infection and hold over, and host-parasite relations.

Successful spraying experiments extending over 6 yr. in central and southern California form the basis of the general recommendation of home-made Bordeaux mixture 8:4:50 applied at least twice; first, as a "prebloom" spray when the buds are expanding and some new growth has developed, but when few or none of the nuts have appeared; and second, as soon as possible after the main fertilization period has passed. If damp weather prevails a third spray is suggested when the nuts average from 0.5 to 1 in. in diameter.

The cost of spraying, the amount of spray required, the profits of spraying and its cumulative effects, the reasons why spraying may fail, the question of spray injury, and the mode of preparation of the spray material are dealt with. Less satisfactory than 8:4:50 Bordeaux mixture in these experiments were several other strengths of Bordeaux mixture, highly refined oil emulsions, basic copper acetate, ammoniacal copper carbonate, Borco, Semesan, Uspulun, Bayer Dip Dust, Neko, iodine, liquor cresolis compound, sodium fluosilicate, calcium chloride, potassium permanganate, and zinc sulfate-lime.

One hundred and seven references are listed.

Liver-spot disease of pecan foliage caused by Gnomonia caryae pecanae nov. var., J. R. COLE (*Jour. Agr. Res. [U.S.], 47 (1933), No. 11, pp. 869–881, figs. 7*).—Liver spot is given as the new name of a foliage disease of pecans, in lieu of the name "western sooty spot", which had been used to some extent. The young spots on the leaves are liver-colored and not sooty or black. The fungus has been distinguished from *G. setacea macrospora* and from a two-spored *Gnomonia* described by Matz in Florida (E.S.R., 39, p. 459). It is sufficiently distinct from *G. caryae* to be given a new varietal name, and is therefore designated as *G. caryae pecanae* n.v. The conidial form is distinct from *Leptothyrium nervisedum*. The fungus was cultivated on a variety of laboratory media and was found to fruit best on a combination medium of hickory or pecan leaves rolled and inserted in a test tube containing corn meal agar. The author was able to prove, according to Koch's rules, that the liver-spot disease was caused by this particular *Gnomonia*.

The clon varieties of pecan vary as to resistance. Schley and Georgia Giant were highly resistant, whereas the Stuart, Van Deman, and Pabst varieties were very susceptible. The disease was found controllable by spraying. One application of Bordeaux mixture on May 27, 1931, gave almost perfect control.

Dusting with monohydrated copper-lime dust for the control of pecan scab on a commercial scale, J. P. Kislanko (*Natl. Pecan Assoc. Proc., 31 (1932), pp. 65–70, figs. 3*).—A 3-yr. supervision of dusting pecan trees with 20–80 monohydrated copper-lime dust in a large commercial orchard proved that pecan scab can be controlled on Success, Schley, and Pabst varieties. In the case of Pabst, which had previously scabbed badly with a loss of crop of approximately 100 percent, after 3 yr. of successive dustings scab was reduced to 4.5 percent light nut infection and slight crop loss as compared with 83.7 percent in a nearby untreated orchard.

On the rotting of carnations [trans. title], O. Verona (*Bol. R. Ist. Super. Agr. Pisa, 8 (1932), pp. 451–455*).—A rotting of carnations due to ***Fusarium herbarum*** and methods of combating the disease are described.—(*Courtesy Biol. Abs.*)

The Verticillium disease of chrysanthemum, G. A. Huber and L. K. Jones (*Washington Sta. Bul. 290 (1934), pp. 15, pls. 5*).—This disease, troublesome to greenhouse growers of chrysanthemums in the State of Washington and elsewhere, is attributed to *V. dahliae* on the basis of isolations from more than 100 plants of several varieties. Cultural characteristics sharply separated the isolates into two groups which appear to comprise distinct physiologic forms, as indicated by inoculation results with a single representative of each.

Beginning at the base, affected plants show a yellowing, followed by browning and death of the leaves. The plants become stunted, and the flowers are reduced in size. In extreme cases the plants wilt and fail to bloom. The pathogen may gain entrance through the roots or be carried in cuttings from diseased stocks.

On the basis of inoculation tests and greenhouse observations, a number of varieties (listed) appear to be resistant to attack.

Steam sterilization of the soil, the use of cuttings from healthy plants, and resistant varieties are recommended.

The biology and symptomology on narcissus of Anguillulina dipsaci Gerv. and v. Ben. in relation to quarantine regulations, C. R. Stillinger (*Northwest Sci., 8 (1934), No. 1, pp. 17–29*).—This article is a general review of the history of the leaf and stem nematode (*A.* (***Tylenchus***) ***dipsaci***) and of the literature regarding it, including 24 references. The life history and characteristics of this nematode are presented, and the effects upon bulbs, particularly narcissus, are described. Based on the author's experience as a field inspector of bulbs, the problem of dealing with this pest is discussed from the viewpoint of the bulb grower.

A disease of Pelargonium zonale produced by a filtrable virus [trans title], G. Verplancke (*Acad. Roy. Belg., Bul. Cl. Sci., 5. ser., 18 (1932), No. 3, pp. 269–281, pl. 1*).—The author describes a mosaic disease found in Belgium on *P. zonale* and *P. hederaceum*, also the cytology of the affected plants. The virus was transmitted from one geranium to another by grafts, and not by wounding or rubbing of the leaves or direct contact of the roots with juice from diseased plants. It appears to be a virus disease and can be transmitted to tobacco by inoculation. Tobacco mosaic was likewise successfully transmitted to *Pelargonium* and reproduced the symptoms of the disease. Addition of lime to the soil appeared to arrest the progress of the geranium disease.

Method of control for crown and root rot of peonies, N. A. Brown (*Amer. Peony Soc. Bul. 55 (1933), pp. 3–6*).—Recovery from the crown rot and root rot of peonies known to be caused by several different fungi was obtained in most instances by cutting out as much of the rot as is possible immersing the roots in water kept at 120° F. for 30 min., as for nematode

control, then planting them in clean soil. In the experiment described, 20 peony roots in various stages of rot were treated with the hot water, then planted in a trench filled with soil that had been sterilized with steam under pressure. The experiment lasted 5 yr. At the end of 1 yr. the roots were dug up and examined. Some had recovered and some were improved, but those worst affected had died. A second treatment with hot water was then given the roots that still showed disease. Four years later all the plants were dug and examined. No root rot, crown rot, or Lemoine disease was present. The plants had blossomed well for 2 yr.

The orange-rust of hawthorn and quince invades the trunk of red cedar, B. O. Dodge (*Jour. N.Y. Bot. Garden, 34 (1933), No. 407, pp. 233–237, figs. 2*).—This note describes the invasion of trunk tissues of red cedar by *Gymnosporangium germinale* and presents several clear photographs of the effects.

Cephalosporium wilt and die-back of the white elm, R. W. Goss and P. R. Frink (*Nebraska Sta. Res. Bul. 70 (1934), pp. 24, figs. 15*).—Investigations following the sudden death of large trees of *Ulmus americana* at Crete, Nebr., in 1931 resulted in the isolation from diseased trees and nursery stock from various localities in central and eastern Nebraska of a still unnamed species of *Cephalosporium*, considered probably identical with that reported by May (E.S.R., 66 p. 843) from other parts of the United States on the same host. Pathogenicity was proved by successful pure culture inoculations of roots, trunks, and twigs of young American elms. The authors describe the mottling and wilting of foliage and discoloration of wood resulting from infection.

On potato dextrose agar the causal organism develops short, usually simple, conidiophores which bear successively at the apex small, elliptical, hyaline, one-celled conidia, averaging $1.9 \times 4.5\mu$, held together in a mucilaginous globular mass which may contain as many as from 50 to 80 spores. Cultural characters, temperature relations, and other factors are described. Attempts to infect Chinese elm (*U. pumila*) were unsuccessful. Control by removal of diseased trees, or thorough excision of invaded parts, is suggested. The possible connection of insects with natural spread is suspected.

Notes on the biology of Ceratostomella ulmi (Schwarz) Buisman, the agent of the Dutch elm disease [trans. title], M. Boudru (*Bul. Inst Agron. et Stas. Rech. Gembloux 2 (1933), No. 4, pp. 310–346, pls. 2, figs. 2; Dutch, Ger., and Eng. abs., pp. 344, 346*).—From a study of the biology of *C.* (*Graphium*) *ulmi*, the author concludes that it grows with difficulty in liquid media. Within rather broad limits (pH 4.4 to 7.4) the influence of pH values on its growth was scarcely noticeable. However, the most suitable growing conditions were at pH 3.2 to 4.4. The behavior of *C. ulmi* in relation to initial acidity of medium indicated the existence of two biologic states, each possessing a characteristic isometabolic point. Moreover, *C. ulmi* is plainly acidifying and does not reduce oxidized dyes. As shown by a rapid endeavor to determine the nutrient requirements, *C. ulmi* was found to have, on the whole, very small needs and to possess a high power of adaptability.

In vitro study of efficiency of certain chemicals tested as fungicides revealed the relatively poor action of mineral salts on *C. ulmi* (solutions of $HgCl_2$ and $NiSO_4$ at 1/2000), while some commercial products and dyes were remarkably effective such as Janus green, aniline green, and brilliant green, at 1/250000; chinosol and ethyl mercury chloride at 1/1000000; and sunoxol and malachite green at 1/2000000.

The application of these data to researches for the discovery of a chemical treatment for Dutch elm disease is discussed.

A new fungus, Pyrenochaetina variabilis, of the Canadian poplar [trans. title], O. SERVAZZI (*Bol. Lab. Sper. Fitopat. [Torino], 28 (1933), No. 6, pp. 113–122, figs. 8*).—*P. variabilis* was found at Moncestino, Savoy, on trees 2 yr. old, causing a drying up of the plant and alterations in the roots. The fungus is described and the life history dealt with in detail. It still remains to be discovered whether the fungus is a true parasite, and the author recommends artificial infection to determine whether it will attack older trees or, as he at present believes, only young plants.

Studies on symbiosis and predisposition to parasitic attack; inheritance of pathological characteristics of our woody plants.—III, Investigations on the rate of growth, moisture content, wood quality, disease attack, and depreciation of spruces tapped for resin [trans. title], [C.] VON TUBEUF and E. HAINES (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 43 (1933), No. 7, pp. 369–417, figs. 11*).—No influence of turpentining on growth in height of spruce was demonstrated. Peripheral growth was increased only in the region just above the cut, and in the rest of the trunk no influence was perceptible. Decomposition by wood-destroying fungi was much favored in the lower part of the trunk, and great timber losses were produced by this factor, the growth of such fungi being favored by the drying out of the water-conducting sapwood under the cut so that it became as deficient in water as the heartwood. This lowering of the quality of the wood formed subsequently to the turpentining was noted only in the region of the cut, and was to be traced back to the decrease in sapwood induced by making the cut.

Temperature relations of wood-destroying fungi, C. J. HUMPHREY and P. V. SIGGERS (*Jour. Agr. Res. [U.S.], 47 (1933), No. 12, pp. 997–1008, figs. 4*).—The effect of constant temperatures on the growth of 64 species and strains of wood-destroying fungi was studied in the laboratory on 2.5 percent malt-extract agar with and without beef extract. The tested fungi were grown in Petri dishes in incubators maintained at the desired temperature by thermostatic control. Radial growth in millimeters measured from the edge of the inoculum was recorded at the end of the first and second weeks. The maximum temperatures for growth were determined for all but 2 cultures; 62 cultures stopped growth at 46° C. or below; 46 cultures at 40° or below; and 24 cultures at 34° or below. Many of the species showed a rapid growth over a considerable range of temperatures around the optimum, and these tolerated a high maximum temperature of from 12° to 16° above the optimum. A downward shifting of the optimum temperatures for growth for successive 7-day observation periods suggests that the optimum temperatures for growth of wood-destroying fungi under controlled laboratory conditions are in some cases higher than the optima for the same decays in nature when carried over long periods.

The root-knot nematode, J. TYLER (*California Sta. Circ. 330 (1933), pp. 34, figs. 5*).—This is a rather comprehensive, nontechnical discussion of the root knot nematode problem and of the most effective practical measures yet devised for dealing with it under a variety of conditions with different types of crops and soils. It presents the life history of this nematode, *Heterodera marioni* (=*H. radicicola*), the influence upon it of temperature and moisture, the conditions of survival, and methods of introduction and spread. Important susceptible plants are listed, as well as reported resistant crops and plants which are regarded as often enduring attack without serious loss. Rotation with resistant plants, fallowing, flooding, desiccation, mulching, hot water treatment of

roots, trap crops, overfertilizing, heat treatment of soil, chemical treatment of soil, and combinations of practices for field control are considered from various angles. Ten selected references to State and Federal publications on root knot are appended.

Flooding to control root-knot nematodes, L. N. Brown (*Jour. Agr. Res.* [*U.S.*], *47* (*1933*), *No. 11*, *pp. 883–888*, *figs. 2*).—Twenty plats were set up in a nematode-infested soil of the Sacramento-San Joaquin Delta, Calif., each 12 ft. square, and enclosed by a watertight redwood wall or curb extending 12 in. above and 18 in. below the ground surface. Plats were submerged for varying periods, then drained and planted to crops. Roots and soil were examined to determine whether nematodes were present. The larvae of the nematode *Heterodera marioni* were killed after 4 months' submergence, but the eggs remained viable after more than 12 months' submergence. All eggs were killed prior to 22½ months' submergence, but the loss of two crops would be necessary to destroy all nematode life by continuous flooding.

Nematode worms in relation to the cockchafer and mealy bug problem in Coorg, W. W. Mayne and V. K. Subramhanyam (*Mysore Coffee Expt. Sta. Bul. 11* (*1933*), *pp. 34*, *pls. 3*).—The question of the importance of the cockchafer and mealy bug in causing large losses of young coffee trees used for replants was considered and the conclusion reached that these could play only a minor part. Evidence obtained suggested very strongly that nematodes are infinitely more important. The authors establish the presence of a nematode, probably *Anguillulina* (*Tylenchus*) *coffeae*, known to be actively parasitic on coffee in Java, in the roots of sickly plants showing symptoms very similar to those found in Java.

Possibilities of direct control of nematodes by soil disinfection are almost negligible. Some change in planting methods adopted on a number of infested areas in the direction of more rapid establishment of replants might lead to a higher percentage of successful establishment. Heavy manuring of the replants, as is being tried in Java, deserves experimental trial. The provision of nematode-free nurseries is essential to either of the above measures. If root plants are used, these should be subject to hot water treatment before planting. Seriously infested areas should be abandoned for coffee. Infested areas should be isolated as far as possible. A keen watch should be kept for plants surviving satisfactorily in nematode-infested areas as possible starting points for selection of resistant strains.

The occurrence of eelworms on the roots of certain grasses, W. C. Johnston (*Jour. Dept. Agr. So. Aust.*, *37* (*1934*), *No. 6*, *pp. 705*, *706*).—The occurrence of cysts of unidentified nematodes was found on the roots of naturalized barley grass and sterile brome grass near nematode-infested wheat and oats in the Bute district of South Australia. Seeded Canary grass (*Phalaris canariensis*) was also found infested.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the President's Committee on Wild-Life Restoration, T. H. Beck, J. N. Darling, and A. Leopold (*U.S. Dept. Agr.*, *1934*, *pp. VIII+27*, *figs. 3*).—This is a report of a preliminary study by the President's Committee on Wild Life Restoration which conferred with Federal and State officials and many leaders in wild life conservation and examined a large amount of material and data bearing on the subject within the period from January 6 to February 8, 1934. Specific recommendations are made as to the manner of accomplishing such restoration. Supplementary memoranda are appended

as exhibits A to F. The plan to withdraw by purchase submarginal lands unsuited for profitable agricultural use is considered to afford an unusual opportunity to carry out a vast and pressingly urgent national program for wild life restoration.

Improving the farm environment for wild life, W. B. GRANGE and W. L. MCATEE (*U.S. Dept. Agr., Farmers' Bul. 1719 (1934), pp. II+62, figs. 20*).—This practical account deals with cover for wild life, increasing the food supply for wild life, protection of wild life, manner of making a farm game survey, and possible returns from game management. It is pointed out that while it does not apply to conditions on all farms, and not necessarily to all parts of any one farm, wherever an increase in the abundance of farm wild life is to be encouraged the recommendations presented will be found useful.

The white-tailed deer of the Adirondacks, M. T. TOWNSEND and M. W. SMITH (*Roosevelt Wild Life Bul. [Syracuse Univ.], 6 (1933), No. 1, pp. 161–325, pls. 2, figs. 96*).—The first part of this contribution (pp. 162–246) consists of a preliminary survey of the white-tailed deer of the Adirondacks; part 2 deals with the ecology of the white-tailed deer in summer, with special reference to the Adirondacks (pp. 247–319).

Control of injurious rodents in California, T. I. STORER (*Calif. Agr. Col. Ext. Circ. 79 (1933), pp. 55, figs. 13*).—A practical account of the control of rodents under California conditions.

Birds that cruise the coast and inland waters, T. G. PEARSON (*Natl. Geogr. Mag., 65 (1934), No. 3, pp. 299–328, pls. 8, figs. 15*).—This sixth contribution of a series which includes paintings by A. Brooks descriptive of all the important families of birds in North America (E.S.R., 69, p. 682) deals with the waterfowl of the coast and inland waters.

A revised list of the birds of southwestern California, G. WILLETT (*Cooper Ornithol. Club, Pacific Coast Avifauna, No. 21 (1933), pp. 204*).—This revision of a list published in 1912 records 446 forms, representing 373 species, 239 genera, 61 families, and 18 orders.

[Notes on economic insects and insecticides] (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 180, 289–293*).—The contributions presented (E.S.R., 70, p. 499) are as follows: *Isotomurus palustris* (Müll.), a Springtail Injurious to Celery, by C. O. Bare (p. 180); A Method for Shipping Mosquito Eggs, by G. H. Bradley (p. 289); Catalase Content and Mortality of Insects Exposed to Lethal Temperatures, by J. H. Pepper (p. 290); Starved Horn-Worm Larvae Make Excellent Laboratory Material, by E. M. Searls (p. 290); A New Pest in Tobacco Plant Beds, *Limnobia ultima* O. S., by J. U. Gilmore and J. Milam (pp. 290, 291); Will Fluorine Compounds Be Accepted as Insecticides? by H. F. Wilson (p. 291); Experiments with Kerosene against Apple Maggot Pupae, by O. H. Hammer (pp. 291, 292); A Suggestion for an Improved Method of Spraying for the Small Home Owner, by F. W. Metzger (p. 292); and Experiments with Rotenone and Derris to Repel the Japanese Beetle (*Popillia japonica* Newm.), by M. R. Osburn (p. 293).

[Insect pest control in the Northwestern States] (*Better Fruit, 28 (1934), No. 9, pp. 5–8, 9, 14–17*).—Contributions relating to insect control presented include the following: Recommendations for codling moth control in Washington for 1934, by R. L. Webster, J. Marshall, W. Brown, D. Starcher, E. L. Overholser, E. J. Newcomer, F. L. Overley, A. R. Chase, A. C. Rich, H. B. Clemens, and S. R. Kelso (pp. 5, 6); Dormant Spraying for Insect Control, by T. P. Strand (pp. 7, 8); Spray Recommendations for Idaho in 1934, by C. Wakeland, R. W. Haegele, C. W. Hungerford, and W. H. Wicks (pp. 9, 14, 15); and Non-Lead Sprays for Codling Moth, by J. Marshall and K. Groves (pp. 16, 17).

[Contributions on economic insects in California] (*Calif. Dept. Agr. Mo. Bul., 22 (1933), No. 7–11, pp. 319–378, 380–384, 387–396, 397–412, figs. 65*).—The contributions relating to economic mites and insects here presented include the following: Insect and Mite Scars of California Fruits, by S. Lockwood (pp. 319–345); A Quarantine Interception of a *Polydrusus* [*P. impressifrons* Gyll.] Larva in California, by H. H. Keifer (p. 345); Recent Developments in Elm Leaf Beetle Control, by D. B. Mackie and C. Haenggi (pp. 346–350); *Drosophila repleta* Woll. (p. 350) and California Microlepidoptera, VI (pp. 351–365), both by H. H. Keifer; Damage Caused by Bean Worms and Some Important Problems Connected with Their Control, by H. K. Plank (pp. 366–378); *Anacampta latiuscula* Loew. in Sugar Beets, by H. H. Keifer (p. 380); Some Differences in Habits and Structure between Citrus Thrips [Orange Thrips] and Flower Thrips [*Frankliniella californica*], by W. Ebeling (pp. 381–384); Some Parasites of *Anarsia lineatella* Zell. in California, by H. H. Keifer and L. S. Jones (pp. 387, 388); Facts Concerning the Spray Residue Problem Pertinent to the Fruit and Vegetable Industries, by A. J. Cox (pp. 389–396); Economic Importance of the Genus *Brachyrhinus* (*Otiorhynchus*), by E. O. Essig (pp. 397–409); and Observations on the Genista Caterpillar *Tholeria reversalis* Guenée (Lepidoptera—Pyralidae), by H. L. McKenzie (pp. 410–412).

[Report of work in entomology at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 357 (1934), pp. 123–127, 137*).—The work of the year referred to (E.S.R., 69, p. 231) includes that with the oriental fruit moth, Mexican bean beetle, European pine shoot moth, potato flea beetle, white apple leafhopper, onion thrips, gypsy moth, European corn borer, Asiatic beetle, Japanese beetle, tobacco insects, the white pine weevil, mosquito control, spraying and dusting, lead arsenate substitutes, and the apiary inspection.

[Contributions on economic insects and their control in Florida] (*Fla. State Hort. Soc. Proc., 44 (1931), pp. 30–35, 51–54, 131–135, 146, 147, 192–198; 45 (1932), pp. 111–123, 131–136; 46 (1933), pp. 48–71, 84–87, figs. 2*).—Contributions relating to economic insects presented at the annual meeting of the society in the spring of 1931 (E.S.R., 67, p. 559) and the special meeting in the fall of 1930 include the following: Comparison of *Crotalaria striata* to *Crotalaria spectabilis* as to the Abundance of Plant Bugs, by J. R. Watson (pp. 30–32); *Cryptolaemus* Ladybeetles as a Control for Mealybugs, by W. L. Thompson (pp. 32–35); Insects and Mites Attacking Citrus Trees in Hawaii, by W. W. Yothers (pp. 51–54); Enforcement of the Plant Quarantine Act, by L. A. Strong (pp. 131–135); and The Pests of Sub-tropical Fruits (pp. 146, 147) and Control of Insects on Satsumas (pp. 192–198), both by J. R. Watson.

Contributions presented at the annual meeting in 1932 are Five Years' Tests with Oil Emulsions on the Growth of Citrus Trees, by W. W. Yothers (pp. 111–114); The Basis of Plant Quarantines, by W. Newell (pp. 114–116); Citrus Insect Control, by J. R. Watson (pp. 116–119); Non-arsenical Stomach Poisons for Grasshopper and Beetle Control, by W. L. Thompson (pp. 119–123); and The Latest concerning Natural Enemies of Citrus Insects, by E. W. Berger (pp. 131–136).

Those presented at the annual meeting in 1933 include Sprays for Scale Insects and Whiteflies on Citrus Trees in Florida, by W. W. Yothers and R. L. Miller (pp. 48–52); Iron Sulfate and Other Materials for Increasing the Effectiveness of Sulfur Insecticides on Citrus Trees, by R. L. Miller, W. W. Yothers, and I. P. Bassett (pp. 52–56); The Effect of Lead Arsenate Insecticides on Citrus Fruits, by R. L. Miller, I. P. Bassett, and W. W. Yothers (pp. 57–71); and Termites as a Pest of Citrus Trees, by W. L. Thompson (pp. 84–87).

[Report of work in entomology at the Michigan Station], R. H. Pettit (*Michigan Sta. Rpt. 1932, pp. 217–239, figs. 29*).—The occurrence of and work of the year with insect pests (E.S.R., 68, p. 351) referred to includes that with the gladiolus thrips, corn ear worm in greenhouses, *Dioryctria abietella*, the hickory bark beetle, house cricket, bean weevil, grasshoppers (*Melanoplus femoratus*, *M. atlanis*, and clear-winged grasshopper), climbing cutworms, tomato stilt bug (*Jalysus spinosus*), sod webworms (*Crambus* spp.), fruit tree leaf roller, saddled prominent, boxelder bug, cherry casebearer, pea aphid, army worm, *Brachyrhinus rugosostriatus*, raspberry mites (*Tetranychus mcdanieli* and *Paratetranychus ilicis*), cherry sawfly leaf miner *Profenusa collaris* MacGillivray, strawberry root weevil, imported rose stem girdler *Agrilus communis rubicola*, San Jose scale, shot-hole borer, flat-headed apple tree borer, and greenhouse leaf tier, and on the prevalence of stored grain insects.

[Entomological investigations in South Carolina in 1933] (*South Carolina Sta. Rpt. 1933, pp. 69–93, figs. 2*).—The work of the year (E.S.R., 68, p. 780) relates to the Japanese beetle, the periodical cicada, and other insects of economic importance; the southern corn stalk borer, corn billbugs (*Calendra callosus* Oliv., *C. maidis* Chitt., etc.), rice weevil, and bollweevil, all by O. L. Cartwright; the oriental fruit moth and the codling moth, by W. C. Nettles; biology and control of thrips attacking cotton, by J. G. Watts and Cartwright; the onion thrips on onions and the gladiolus thrips on gladiolus; and the tomato fruit worm, Mexican bean beetle, and a faunal survey, by F. Sherman.

The changed status of some insect pests in Puerto Rico, G. N. Wolcott (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 3, pp. 265–270*).—A contribution from the Insular Experiment Station.

Injurious insects of Nova Scotia.—Part 1, Fruit insects, W. H. Brittain and A. D. Pickett (*Nova Scotia Dept. Agr. Bul. 12, rev. (1933), pp. 123, pls. 40, figs. 32*).—This is a revision of an account by Brittain previously noted (E.S.R., 59, p. 552).

[Economic insects on the Maltese Islands], P. Borg (*Malta Dept. Agr. Ann. Rpt., 1932, pp. XVI–XVIII*).—A brief account is given of the status of the Mediterranean fruit fly and several other insects of importance in the Maltese Islands.

Report of the entomological service for the years 1931 and 1932, E. Ballard (*Palestine Dept. Agr. and Forests Rpt., 1931–32, pp. 85–94*).—This brief report of the work of the years 1931 and 1932 deals particularly with insects affecting citrus.

Report of the Government entomologist for 1932, H. Hargreaves (*Uganda Dept. Agr. Ann. Rpt., 1932, pt. 2, pp. 50–54*).—A brief report of the occurrence of and work of the year with the more important insects in Uganda (E.S.R., 69, p. 548).

Further observations on mushroom insects, C. A. Thomas (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 200–208*).—This account contributed from the Pennsylvania Experiment Station supplements the information presented in the accounts previously noted (E.S.R., 67, p. 565; 70, p. 356). It deals with new control measures and the commercial application of some methods which had previously been tried only experimentally.

Potato spraying and dusting experiments on Long Island, H. Menusan, Jr., and W. Dickison (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 112–118*).—This contribution relates to dusting and spraying experiments with potatoes conducted in Nassau County, Long Island, N.Y., during the seasons 1930 to 1933, the details of which are presented in tabular form. Little or no increase in yield of tubers has been secured from the procedures tested.

Studies of milliped and gnat injuries to potato tubers, G. F. MacLeod and F. G. Butcher (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 106–108*).—In control work in western New York where potato tubers have been severely injured by the feeding activities of millipeds (*Diploiulus londinensis coeruleocinctus*) and fungus gnat larvae (*Sciara* sp.), sulfur has given the largest reduction in proportion of injuries, but none of the materials used gave satisfactory commercial control of the pests. It appears that under certain conditions sulfur materially reduced gnat and milliped injuries to potato tubers, provided the hydrogen-ion concentration of the soil was reduced to below pH 5. The degree of effectiveness, however, fluctuated widely, due, it is thought, to regional differences.

[Contributions on animals attacking shade and ornamental trees] (*Natl. Shade Tree Conf. Proc., 9 (1933), pp. 3–10, 49–94, 101–105*).—The contributions relating to animal enemies of shade trees presented at the ninth annual meeting of the National Shade Tree Conference, held in New York, N.Y., in September 1933 (E.S.R., 69, p. 384), include the following: Some Shade Tree Problems, by E. P. Felt (pp. 3–10); Some Important Insect Enemies of Shade Trees in Central and Southern California, by H. E. Burke (pp. 49–59); The Control of Insects Boring in Ornamental Shrubs and Shade Trees, by C. C. Hamilton (pp. 59–73); The Scope of the Shade-Tree and Hardy-Shrub Insect Problem, with Special Reference to the Conditions Found in 1932, by W. Middleton (pp. 73–85); Injury to Trees by Squirrels, by W. E. Britton (pp. 85–91); Practical Control Work on European Pine Shoot Moth and White Pine Weevil in C.C.C. Camps, in Connecticut, by T. J. Parr (pp. 92–94); and How the Dutch Elm Disease Reached America, by R. K. Beattie (pp. 101–105).

Shade tree insects in 1933, E. P. Felt (*Jour. Econ. Ent., 27 (1934), No. 1. pp. 195–200*).—The occurrence of insect enemies of shade trees in the northeastern United States in 1933 is noted.

(Entomological investigations on the spike disease of sandal, XII–XVII (*Indian Forest Rec., 18 (1933), No. 13, pp. 26, pls. 2; 19 (1933), No. 2, pp. 10, figs. 4; 19 (1934), Nos. 4, pp. 30, pl. 1, figs. 8; 5, pp. 12, figs. 6; 6, pp. 9, pl. 1; 7, pp. 10, pls. 2*).—Part 12 of these studies (E.S.R., 70, p. 358) deals with the life history and morphology of *Eurybrachys tomentosa* Fab. (Fulgoridae; Homoptera), by N. C. Chatterjee; part 13 with the Membracidae and Cercopidae (Homoptera)—supplementary data, by N. C. Chatterjee and M. Bose; part 14 with the Jassidae (Homoptera), by H. S. Pruthi; part 15 with the Cicindelidae (Coleoptera) and supplementary data on Neuroptera and Elateridae (Coleoptera), by N. C. Chatterjee; part 16 with Coccinellidae (Coleoptera), by R. Korschefsky; and part 17 with Coccinellidae (Coleoptera)—supplementary data, by N. C. Chatterjee and M. Bose.

Insect infections: Immunity and symbiosis, A. Paillot (*L'Infection chez les insectes: Immunité et symbiose. Trévoux, France: G. Patissier, 1933, pp. 535, figs. 279*).—The several parts of this work deal with the subject as follows: Diseases due to Protozoa (pp. 9–51), fungi (pp. 53–84), ultraviruses (pp. 85–117), and bacteria (pp. 119–196), natural and acquired immunity to bacterial infection (pp. 197–312), symbiosis in the aphids and cimicids (pp. 313–427), and the economic utilization and the role of insects in disease transmission (pp. 429–470). A classified bibliography is included (pp. 471–520).

On the hereditary ability of certain insects to transmit diseases and to cause diseaselike injuries to plants, F. W. Poos and N. H. Wheeler (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 58–69, figs. 7*).—Inheritance tests with the potato leafhopper have led the authors to conclude that it inherits the ability to cause a diseaselike injury to legumes and other crops, both nymphs and adults having caused the characteristic injury.

Experiments with the green peach aphid led to the conclusion that infective parents do not transmit to their offspring the virus of spinach blight, and that the ability of the adults to infect healthy spinach plants with this blight is decreased by their removal for several hours from infected material.

A list is given of 20 references to the literature.

Review of United States patents relating to pest control, [January–December 1933], R. C. ROARK (*U.S. Dept. Agr., Bur. Chem. and Soils, Rev. U.S. Pat. Relat. Pest Control, 6 (1933), Nos. 1, pp. 8; 2, pp. 7; 3, pp. 8; 4, pp. 8; 5, pp. 16; 6, pp. 10; 7, pp. 14; 8, pp. 14; 9, pp. 7; 10, pp. 8; 11, pp. 12; 12, pp. 11*).—This is in continuation of the reviews previously noted (E.S.R., 69, p. 73).

The investigation of arsenical insecticides, P. A. ROWAAN (*De Beoordeeling van arsenhoudende insecticiden. Groningen, Netherlands: M. de Waal, 1932, pp. [4]+92; Eng. abs., pp. 91, 92*).—Following a general introduction which deals briefly with some entomological and economic details, the results of chemical investigations, including volumetric methods for the determination of arsenic in insecticides, are presented (pp. 5–73), followed by the results obtained from physical investigations (pp. 74–90). Attempts have been made to set up standard requirements for the three prominent arsenical compounds, namely, paris green, lead arsenate, and calcium arsenate.

Symposium on the spray residue problem (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 124–180*).—Contributions to this symposium conducted by P. J. Parrott at Cambridge, Mass., December 29, 1933, as a part of the annual program of the American Association of Economic Entomologists include the following: The Current Season's Experience in Enforcing Spray Residue Tolerance, by W. B. White (pp. 125–133); The Status of Codling Moth Control with Insecticides, by R. L. Webster (pp. 134–139); The Status of Codling Moth Control in the Pacific Northwest, by E. J. Newcomer (pp. 139–141); Codling Moth Control by the Use of Insecticides in Michigan, Ohio, Indiana, and Illinois, by W. P. Flint (pp. 141–143); Status of the Codling Moth in the Northeastern States, by S. W. Harman (pp. 143–145); The Status of the Codling Moth Control in the Shenandoah-Cumberland Fruit Region, by W. S. Hough (p. 145); The Codling Moth Situation in Ontario, by W. A. Ross (pp. 146, 147); To What Extent May Organic Insecticides Be Used as Substitutes for Arsenicals? by T. J. Headlee (pp. 148–155); The Situation in the Vegetable Industry with Respect to the Use of Arsenicals and Arsenical Substitutes, by H. C. Huckett (pp. 156–161); Latest Developments in Washing Apples, by R. H. Robinson (pp. 162–167); and Influence of Spray Schedule and Other Factors on Spray Residue Removal, by H. C. McLean and A. L. Weber (pp. 168–179).

Recent developments in oil sprays (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 269–289, figs. 3*).—Part 1 of this contribution, which deals with fundamental laboratory studies and determinations, is by H. Knight (pp. 269–279), and part 2, dealing with the results of field tests on codling moth and pear psylla, is by C. R. Cleveland (pp. 279–288).

The extent to which the practice of not burning cane trash has been adopted in Puerto Rico, G. N. WOLCOTT (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 3, pp. 197, 198*).—A survey made by the Puerto Rico Insular Experiment Station in fields to be ratooned at the height of the grinding season (April 3, 4, 5) 1933 showed that trash was burned in 77 and not burned in 227 fields.

The use of oil in grasshopper baits.—A preliminary report, J. R. PARKER, R. L. SHOTWELL, and F. A. MORTON (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 89–96*).—In this preliminary report a comparison is made of ordinary poisoned bran mash with oil bait in laboratory and field tests. The results obtained

in the laboratory and field indicate that oil can be substituted for both molasses and water in ordinary grasshopper baits without decreasing their immediate killing effect, and that their effectiveness will be longer sustained when oil is used.

Three years' work against grasshoppers in Minnesota, A. G. Ruggles (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 96–101, figs. 4*).—Contributing from the Minnesota Experiment Station, the author reports upon the results of the control campaign in that State against grasshoppers conducted during the years 1931, 1932, and 1933. It is concluded that if an outbreak of this nature is attacked methodically and relentlessly through proper organization to make control measures effective, coupled with the proper expenditure of funds for control materials, success will be the result. The account is accompanied by map charts of the State showing the grasshopper infestation for the years 1931, 1932, 1933, and 1934.

The Thysanoptera of Italy [trans. title], A. Melis (*Redia, 20 (1933), pp. 1–187, figs. 72*).—The author considers the genus *Melanthrips* in connection with a seven-page list of references (pp. 3–143) and the genus *Aeolothrips* with two references to the literature (pp. 145–187).

Further studies on the control of the onion thrips, F. B. Maughan (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 109–112*).—In continuation of the studies previously noted (E.S.R., 69, p. 76) the author conducted experiments which indicate that "both naphthalene-hydrated lime dust and undiluted crude chipped naphthalene applied by hand will control onion thrips. If, however, dusting machinery is available, most economical and satisfactory protection may be obtained by using a naphthalene-hydrated lime dust."

Key to all known species of the genus Taeniothrips Amyot & Serville (Thysanoptera: Thripidae), J. B. Steinweden (*Amer. Ent. Soc. Trans., 59 (1933), No. 4, pp. 269–294, pl. 1*).—This is a key to a genus that includes many species of economic importance. They occur in all parts of the Temperate and Tropical Zones, living in flowers and upon the leaves of various kinds of plants and many spending part of their life in the ground or under leaves and fallen vegetation.

Investigations on the green vegetable bug (Nezara viridula Linn.), E. H. Zeck (*Agr. Gaz. N.S. Wales, 44 (1933), Nos. 8, pp. 591–594, figs. 2; 9, pp. 675–682, figs. 2*).—This is an account of studies of the southern green stinkbug, first recorded in New South Wales as a pest in 1916 (E.S.R., 37, p. 55), and which now occurs over an area of approximately 50,000 sq. miles in that State, mainly as an enemy of beans and tomatoes.

The green stink-bug (Nezara viridula Linn.), P. W. van Heerden (*Ann. Univ. Stellenbosch, 11 (1933), A, No. 7, pp. 24, pls. 2*).—The anatomy and biology of and control measures for the southern green stinkbug, chiefly a truck crop pest of secondary importance in the Union of South Africa, are dealt with.

Lygus hesperus Knight (Hemiptera, Miridae) in relation to plant growth, blossom drop, and seed set in alfalfa, W. E Shull, P. L. Rice, and H. F. Cline (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 265–269*).—This is a contribution from the Idaho Experiment Station in which details of the effect of *L. hesperus* on the drop of blossoms in alfalfa are presented in tabular form. Preliminary experiments indicate that if *Lygus* insects occur in sufficient numbers on growing plants they will so limit the growth of the plants as to cause considerable reduction in the hay yield. The data obtained are considered to show definitely that this insect may cause injury to alfalfa blossoms so that the flowers will not develop and seed will not be set. Injury to punctured alfalfa seeds appeared on the seeds in the form of depressions.

small holes, or the shriveling of the seed. Most of the seeds which were injured were probably so light that they would be blown out of machine-cleaned seed. This type of injury does not affect the market value of the cleaned seed but reduces the yield.

Winter spraying trials against the apple capsid bug on mixed varieties of apple trees, R. A. HARPER GRAY and H. E. BROOKS (*Jour. Min. Agr. [Gt. Brit.], 40 (1933), No. 7, pp. 630–635, pl. 1*).—The results obtained in work with the apple capsid bug (*Plesiocoris rugicollis*) indicate that although washes applied in winter against the eggs may be effective in an orchard containing 16 varieties of apples in nine rows, there is considerable variation in their efficiency.

The washes that gave the best general control were (1) a proprietary mixed wash at 10-percent concentration and (2) a tar distillate wash at 5 percent mixed with mineral oil emulsion at 7.5 percent. By reducing the mineral oil emulsion to 5-percent concentration the effectiveness of this along with the tar distillate was reduced. The proprietary mixed wash also gave a less efficient control at a concentration below 10 percent.

"The numbers of damaged blossom shoots are not necessarily a guide to the amount of damage likely to appear on the ultimate fruit. Observations made during the trials seem to show that even when shoots are moderately highly attacked by the apple capsid bug after winter spraying, and when the yield of apples is relatively large, the number of marked apples may be comparatively small. When, on the other hand, the crop is small, the percentage of marked fruit may be high, even when relatively few shoots have shown damage from the apple capsid bug."

Chinch bug resistance in corn: An inherited character, J. R. HOLBERT, W. P. FLINT, and J. H. BIGGER (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 121–124, figs. 3*).—The results of a year's work with corn in Illinois indicate that some inbred lines carry dominant factors for chinch bug resistance, while others carry dominant factors for chinch bug susceptibility. The results suggest that strains of corn may be developed which will combine chinch bug resistance in a significant degree with other important characteristics concerned with satisfactory yield of high quality grain.

A new enemy of cotton in French Equatorial Africa, Helopeltis bergrothi Reut. [trans. title], A. P. MOREAU (*Agron. Colon., 22 (1933), No. 191, pp. 129–140, fig. 1*).—An account of *H. bergrothi* and its association with the disease of cotton due to *Bacterium malvaccarum*.

The effect of alfalfa cutting schedules upon the occurrence of the potato leafhopper (Empoasca fabae Harris) and alfalfa yellows in Wisconsin, E. M. SEARLS (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 80–88, fig. 1*).—Experimental work by the Wisconsin Experiment Station indicates that alfalfa cutting may be so synchronized with the life cycle of the potato leafhoppers as to suppress the leafhopper infestation by destroying a large part of either the egg or nymphal stage. It is shown that controlling the insect either by cutting the host plant at certain times or by the use of chemicals permitted the alfalfa to make a more normal growth, and that the unhampered growth of the alfalfa tended toward the suppression of weeds. The destruction of the leafhopper infestation by cutting schedules properly synchronized with the vulnerable stages of the insect's life history was sufficient to produce a satisfactory growth of alfalfa in the absence of all other leafhopper control measures.

Control of aphids on alfalfa in the Antelope Valley, Calif., R. A. BLANCHARD (*U.S. Dept. Agr. Circ. 307 (1934), pp. 7*).—This is a report of a study supplementing that previously noted (E.S.R., 70, p. 505) of the pea aphid and the

cowpea aphid. These become numerous every year on alfalfa in the Antelope Valley and in other districts in southern California, the pea aphid often causing serious losses, it being represented throughout the season by viviparous forms. The investigations have shown heavy winter pasturing followed by cultivation to be an effective control, pasturing or cultivation alone being effective only during normal spring seasons. Early irrigation was found to be advisable in some cases. The cutting of alfalfa just before damage becomes severe resulted in good control and in the securing of an early second crop. Burning over the fields with mechanical burners resulted in a good first crop where the burning was thorough and was applied not earlier than March 12.

Alfalfa plants resistant to the pea aphid, R. A. Blanchard and J. E. Dudley, Jr. (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 262–264*).—Observations of the resistance of alfalfa plants to damage by the pea aphid conducted by the authors independently in California and Wisconsin are briefly noted.

Control of the green peach aphid on the Murrumbidgee irrigation area, P. C. Hely (*Agr. Gaz. N.S. Wales, 44 (1933), No. 10, pp. 751–758, figs. 2*).—In the experiments conducted in 1931 and 1932 tar distillate washes gave good control of the green peach aphid when used at concentrations of 1 in 40 or higher. These washes showed definite ovicidal value even in dilutions up to 1 in 80. The author recommends that they be used at 1 in 40, at which strength they are reasonably cheap, safe, and effective. It is shown that at 1 to 40 these tar distillates gave decided control of the fungus disease peach leaf curl as a secondary effect.

A year's experience with the cottony cushion scale in Puerto Rico, G. N. Wolcott and F. Seín, Jr. (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 3, pp. 199–221, pls. 4*).—This is an account of observations by the Puerto Rico Insular Experiment Station of the cottony-cushion scale, which is known to have been present on rose bushes in Puerto Rico since early in 1931 and presumably for some time previously.

"Natural dispersion of the scale is by the prevailing northeast winds, from the original focus in San Juan and Santurce to the west and southwest. In the citrus groves well protected by windbrakes the scale was entirely eliminated by an entomogenous fungus, *Spicaria javanica*, never before recorded from Puerto Rico, which attacked it during the extremely wet weather of May 1932 and persisted during the following humid summer months."

The vedalia, which was introduced into the island, is said to be reasonably efficient in cleaning up scale infestations in less humid locations. Of the native parasites, the most important is a phorid fly, *Syneura cocciphila* Coq. The scale is also attacked by the hymenopterous parasite *Cheiloneurus pulvinariae* Dozier and by the small lady beetle *Decadiomus pictus* Chapin.

Citrus red scale: Experiments with liquefied hydrocyanic acid gas fumigation, P. C. Hely (*Agr. Gaz. N.S. Wales, 44 (1933), No. 11, pp. 823–826*).—Preliminary experiments with liquefied hydrocyanic acid gas for control of the California red scale, work with which has been conducted for the first time in New South Wales, are briefly referred to.

Winter survival of the potato tuber moth (Phthorimaea operculella Zell.), G. S. Langford (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 210–213*).—The author concludes that if the potato tuber worm is to winter successfully in Maryland under field conditions the stages involved must be located in well protected and shaded locations.

Ermine moths as serious enemies of fruit trees [trans. title], O. Jancke (*Arb. Biol. Reichsanst. Land u. Forstw., 20 (1933), No. 4, pp. 431–441, figs. 5*).—This contribution, presented in connection with a list of 19 references to the literature, deals with the geographic distribution and importance of *Hypono-*

meuta spp., *their control, etc.* The ermine moth on apple is considered by the author to be a biological race of *H. padellus* L. on plum. In summer the larvae are destroyed by arsenical or contact sprays. The use of poison bait sprays containing sodium fluoride (1:250) or derris (1:100) with 3 percent of sugar gave a mortality of from 80 to 85 percent. Almost complete control of young larvae in hibernation was obtained in the spring of 1932 by application of an 8 to 10 percent fruit tree carbolineum spray.

Influence of undernourishment of caterpillars of the meadow moth Loxostege sticticalis L. upon the duration of the larva phase and fertility of imago [trans. title], N. N. SINIṮSKIĬ (SINITZKY) and E. S. SHEKERA (*Nauk Zap. Tsukr. Promis., 10 (1933), No. 33, pp. 77–89, pls. 2; Eng. abs., p. 88*).—The authors find that moths of the beet webworm that have been undernourished while in the caterpillar stage lay fewer eggs than those normally nourished, even when equal proportions of an additional nutriment have been supplied them.

Spray tests for codling moth, T. J. HEADLEE (*N.J. Agr., 15 (1933), No. 6, p. 5*).—In this contribution from the New Jersey Experiment Stations a brief report is made of the results of spraying tests on apple blocks in an orchard badly infested with the codling moth, in which for two or more years no paying crop had been harvested because of codling moth injury. The work was commenced in the spring of 1933 with an average overwintered population of 175 worms per tree, the crop set in 1933 not exceeding 20 percent of a normal crop. Of the four principal blocks, No. 1 received the heavy lead arsenate spray schedule (10-day intervals) throughout the season; No. 2, the same number of treatments and the same materials except for five treatments (three in first brood and two in second brood) consisting of 0.6-percent oil in the emulsion form plus arsenate of lead at one half strength; No. 3, the same treatment as No. 2 for the first brood and 0.6-percent oil plus nicotine sulfate (1 to 800) at 7-day intervals for the second brood; No. 4, nicotine tannate plus bentonite sulfur at 10-day intervals for the first brood and one half nicotine tannate at 7-day intervals for the second brood and the second half nicotine tannate plus bentonite sulfur at 7-day intervals for the second brood.

At the close of the season, No. 1 had 10.9 percent of fruit entirely free from codling moth injury of all kinds; No. 2, 13.3 percent; No. 3, 34.1; No. 4 (first half), 44.5; and No. 4 (second half), 51.6 percent. No. 1 had 44.3 percent of its fruit salable; No. 2, 45.2; No. 3, 81.0; No. 4 (first half), 84.2; and No. 4 (second half), 85.0 percent.

[Control work with the codling moth] (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 218–239, 240–261, fig. 1*).—Contributions here presented relating to control work with the codling moth include the following: Experiences with the Codling Moth in New York during 1933, by P. J. Parrott (pp. 218–222); Codling Moth Experiments during 1933, by S. W. Harman (pp. 222–225); The Problem of Codling Moth Control in Delaware, by L. A. Stearns (pp. 225–229); Codling Moth Conditions and Control in West Virginia, by E. Gould (pp. 229–232); Codling Moth in Pennsylvania, by H. E. Hodgkiss, H. N. Worthley, and D. E. Haley (pp. 232–239); Codling Moth Spraying Experiments in Pennsylvania in 1933, by H. N. Worthley (pp. 240–244); Modifying the Codling Moth Control Program, by L. B. Smith and H. E. Hodgkiss (pp. 244–249); Comparative Tests of Arsenicals, Arsenicals with Oil, and Several Nicotine Compounds Used against the Codling Moth, by B. F. Driggers and B. B. Pepper (pp. 249–258); and A Defoaming Material for Use in Apple Washing Machines, by J. L. Horsfall and D. W. Jayne, Jr. (pp. 259–261).

[Codling moth control in the Northwestern States] (*Better Fruit, 28 (1934), No. 8, pp. 5–9, 10, 14, 15, 17, 20, fig. 1*).—Contributions on the codling

moth presented include the following: Arsenic Deposit and Codling Moth Control, by R. L. Webster (pp. 5, 6); Codling Moth and Its Control in the Hood River Valley, by L. Childs (pp. 7, 17); An Effective Codling Moth Control Program, by E. J. Newcomer (pp. 8, 9); and Idaho Spray Program for Codling Moth Control in 1934, by C. Wakeland (pp. 10, 14, 15, 20).

Results of two years' work with an attractive spray for corn ear worm moth (Heliothis obsoleta Fab.), R. C. Burdette (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 213–217*).—In experiments at the New Jersey Experiment Stations syrline, an invert sugar sirup, 8 lb. to 50 gal. of water, when sprayed upon the foliage was found to be an attractant for moths of the corn ear worm. When 1.5 to 2 lb. of tartar emetic to 50 gal. of spray was used as the insecticide, the moths were killed. It was found in the experiments that in cages the moths did not oviposit after feeding on the tartar emetic spray, but this was not the case under field conditions, the moths attracted to the sprays having fed upon it and then spread through the field ovipositing until the poison took effect. Failure of the spray was attributed to the slowness of the poison used in the attractive spray bait. It is thought that the syrline spray is sufficiently attractive so that from 85 to 90 percent of the moths would feed, but that a faster acting poison must be substituted for the tartar emetic in the spray.

The lima bean pod-borer caterpillars of Puerto Rico, G. N. Wolcott (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 3, pp. 241–255, pl. 1, figs. 6*).—This contribution from the Puerto Rico Insular Experiment Station reports upon studies of three species of pod-boring caterpillars which attack lima beans in Puerto Rico and constitute the greatest obstacle to the profitable production of this crop, namely, *Maruca testulalis* Geyer, the lima bean pod borer, and *Fundella cistipennis* Dyar.

Sugar cane borer hibernation and the effects of various methods of trash disposal upon the survival of borers therein, W. E. Hinds (*Sugar Bul., 12 (1934), No. 7, pp. 3–5*).—In this contribution from the Louisiana Experiment Station a brief summary of records for 1927–33 relating to sugarcane borer hibernation and the effects of burning, burial, etc., upon borer survival is given in detail in tabular form. The data presented show that the burning of trash is very effective in decreasing the borer population in hibernation, and that the more thorough the burn the more effective is this method of control. Vegetable matter may be replaced most cheaply by the growth of legume crops, and the effect upon the hibernation of the egg parasite *Trichogramma minutum* is considered to be negligible.

The tea tortrix (Homona coffearea Nietn.), C. B. R. King (*Tea Quart. [Tea Res. Inst. Ceylon], 6 (1933), No. 4, pp. 153–175, fig. 1*).—This is an account of studies of the insect which, next to termites, is considered the most important enemy of tea in Ceylon. Particular attention is given to its natural enemies, of which the wilt virus is the most important limiting factor.

The boxwood leaf miner and its control, W. Middleton and F. F. Smith (*U.S. Dept. Agr. Circ. 305 (1934), pp. 8, figs. 5*).—A brief account of the habits and work of the boxwood leaf miner is followed by a more extended account of means of control, three methods being outlined, namely (1) spraying with nicotine sulfate, molasses, and water, (2) fumigation with hydrocyanic acid gas, and (3) immersion in hot water.

Another basket-willow pest, H. F. Barnes (*Jour. Min. Agr. [Gt. Brit.], 40 (1934), No. 10, pp. 923–925, pls. 2*).—This contribution from the Rothamsted Experimental Station relates to the dipterous cambium miner *Dizygomyza barnesi* Hendel, studies of the morphology and biology of which have been noted (E.S.R., 70, p. 67).

Contribution to the biology and control of the cherry fruit fly Rhagoletis cerasi [trans. title], O. JANCKE and W. BÖHMEL (*Arb. Biol. Reichsanst. Land u. Forstw., 20 (1933), No. 4, pp. 443–456, figs. 2*).—An account of the biology and of control measures for *R. cerasi*, based upon observations in central Germany from 1930 to 1932. Used on sour cherry, a bait spray consisting of 1:250 of sodium fluoride sweetened with sugar or molasses was the most effective.

A list of 15 references to the literature is included.

Anastrepha (Trypetidae, Diptera) fruit flies in Puerto Rico, F. SEÍN, JR. (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 3, pp. 183–196, pls. 5*).—In this contribution from the Puerto Rico Insular Experiment Station two species of fruit flies of the genus *Anastrepha* are said to occur in Puerto Rico, namely, the West Indian fruit fly, a new variety of which is here described by the author as *A. fraterculus* Wied. *mombinpraeoptans*, and *A. unipuncta* n.sp., which attacks guava and many other fruits.

Descriptions of some native trypetid flies with notes on their habits, F. H. BENJAMIN (*U.S. Dept. Agr., Tech. Bul. 401 (1934), pp. 96, figs. 44*).—In this report of a study made of the native species of trypetid flies, much of the material for which was reared by D. J. Nicholson during the campaign to eradicate the Mediterranean fruit fly in Florida, the author considers their classification with a view to the identification of immature stages as well as the adult flies. A key is given for the identification of the genera and subgenera found in Florida. The work has led to the erection of a new genus, *Zonosemata*, and two new subgenera, *Euarestoides* and *Tephritoides*, and descriptions of seven species new to science. A list of 100 references to the literature cited is included.

The green June beetle in lawns, W. A. PRICE (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 69–72, figs. 2*).—Reference is made to damage caused by the green June beetle in Kentucky, and means for its control.

The larval period of Diaprepes abbreviatus L., G. N. WOLCOTT (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 3, pp. 257–264, pl. 1*).—Contributing from the Puerto Rico Insular Experiment Station, the author reports upon observations of the larval period of the weevil root borer of sugar cane, etc., the details being given in tabular form.

Barium fluosilicate (Dutox) in blister beetle control, H. F. DIETZ and E. E. ZEISERT (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 73–79*).—Contributing from the Ohio Experiment Station, the authors report upon recent outbreaks of blister beetles in north central Ohio in which the margined blister beetle and the black blister beetle were implicated. In experimental control work in the field it was found that barium fluosilicate dusts offer a simple, effective, and inexpensive control for these beetles and appear to be safe for a comparatively high range of plants.

Notes on Texas Coccinellidae, J. C. GAINES (*Bul. Brooklyn Ent. Soc., 28 (1933), No. 5, pp. 211–215*).—In this contribution from the Texas Experiment Station the author lists 64 species and varieties of ladybird beetle, collected principally in the vicinity of College Station and in Hidalgo County, 19 of which are recorded from the State for the first time.

The tortoise beetle Cassida nobilis L. with some observations on C. nebulosa L. [trans. title], O. KAUFMANN (*Arb. Biol. Reichsanst. Land u. Forstw., 20 (1933), No. 4, pp. 457–516, figs. 41*).—The life history and bionomics, morphology, and control, including natural enemies, of the tortoise beetles that attack sugar beets in Germany are dealt with.

The life history and control of the potato flea beetle (Epitrix cucumeris Harris) on the Eastern Shore of Virginia, L. D. ANDERSON and H. G

Walker (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 102–106*).—The results obtained by the Virginia Truck Experiment Station in the potato flea beetle experiment conducted in 1933, giving the insecticides and proportions used and the yields expressed in barrels per acre, are presented in detail in tabular form.

Some effects on potato flea-beetle (Epitrix cucumeris Harris) injuries and yields by spraying, D. O. Wolfenbarger (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 118–120*).—Three years' spraying experiments with muck land potatoes in western New York in which Bordeaux mixtures alone and in combination with lead or calcium arsenate or with barium fluosilicate as potato sprays were compared show that these materials do not adequately control the potato flea beetle. Bordeaux mixture 5:7:50 combined with 2 lb. of calcium arsenate was the most effective of the materials tested. This material gave a reduction of 17 holes per leaflet and 4 feeding scars less than the check, with a corresponding gain of over 100 bu. per acre more than the check.

Further experiments with package bees, R. S. Filmer (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 191–195*).—In continuation of work at the New Jersey Experiment Stations (E.S.R., 67, pp. 561, 580), the author reports experiments which seem to justify the conclusion that the stimulating of brood rearing in overwintered colonies by the addition of package bees and the later division of these colonies is a practical method for securing additional pollinating colonies of average strength.

Recent experiments in the control of two Puerto Rican ants, G. N. Wolcott (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 3, pp. 223–239*).—In experimental control work at the Puerto Rico Insular Experiment Station with the fire ant, thallium compounds and mixtures failed to control it outdoors, although the use of thallium sulfate sirup indoors was uniformly successful. "An emulsion of crude carbolic acid, either alone or mixed with kerosene emulsion or the engine oil emulsion sprays used for scale control, is still the cheapest and most effective insecticide to use against this ant in citrus groves, pineapple plantings, and vegetable gardens. Against the hormiguilla, *Myrmelachista ambigua ramulorum* Wheeler, a bait consisting of ground meat and thallium acetate is very effective and gives promise of being adopted commercially when cheaper and simpler methods of application are devised."

***Studies on parasites of the oriental fruit moth.*—II, Macrocentrus ancylivorus,** P. Garman and W. T. Brigham (*Connecticut [New Haven] Sta. Bul. 356 (1933), pp. 69–116, figs. 12*).—The first part of this second contribution (E.S.R., 70, p. 216) deals with the oriental fruit moth (pp. 74–88); the second part with the larval parasite *M. ancylivorus* (pp. 88–113). The field and laboratory work, which was commenced in 1929, was conducted in conjunction with that of the *Trichogramma* egg parasite, previously reported (E.S.R., 70, p. 216).

Three generations of *M. ancylivorus* were reared under insectary conditions at New Haven during the summer. The adults were observed to be present almost continuously in the field after the first of June. The life history of this parasite and of the oriental fruit moth are similar in many respects, the life cycle of the parasite in general being shorter than its host. "Oviposition continues under favorable conditions for about 12 days. The ratio of increase averaged in our experiments 12 per female, but reached 50 per female in some tests. The rate of egg deposition is 10 to 15 daily for 10 to 14 days after they begin to lay. Thereafter, oviposition becomes considerably less. Hibernation does not affect the sex ratio or rate of increase of the generation emerging. Of the *Macrocentrus* obtained from exposures made August 5 to 6, 0.5 percent hibernated. From then on in 1932 an increasing percentage passed

the winter. The sex ratio of field collected material was about 3 to 2, or 41 percent males. Various methods were used to reduce the ratio to these figures in laboratory breeding. The most successful resulted from special mating experiments.

"It required about 14 fruit moth eggs for every *Macrocentrus* adult reared in 1931. *Macrocentrus* reared by artificial means from 1930–33 totaled 112,983. We secured 12,000 for liberation in orchards during 1932 and 1933. It is easier to secure a high percentage of parasitism using peach twigs infested with fruit moth larvae than by using sliced apples. The chief enemies are spiders, ants, and secondary parasites. Methods of control are discussed. Sulfur dust applied to foliage shortened the life of *Macrocentrus* in cages. Methods of breeding are given. . . .

"Twenty thousand *Macrocentrus* were obtained in 2 yr. from field collections in New Jersey. These were all liberated in peach orchards. Field studies of the parasite indicate that it will live from year to year in the same orchard, and that its presence is correlated with a general reduction of fruit infestation when the parasitism of the second brood fruit moth larvae is high. It required 3 yr. in the Root and Bishop orchards to bring about the desired parasitism. The orchard of the Connecticut State College at Storrs seems to be following this course. In the Pero orchard parasitism developed more rapidly."

The details of the work are reported in tabular form. A list of 14 references to the literature is included.

Occurrence of tick parasites in nature in southern Idaho, R. A. Cooley (*Pub. Health Rpts.* [U.S.], *49* (*1934*), *No. 4*, *pp. 111, 112*).—The author reports the rearing of the tick parasite *Ixodiphagus texanus* How. from two nymphs of *Ixodes hexagonus cookei* (Pack.) collected from a woodchuck trapped near Mayfield, Idaho, June 28, 1932. The living strain of *I. texanus* taken from Idaho has been held alive, and several generations have been reared in the Public Health Service Laboratory at Hamilton, Mont. So far as observed in the rearing of *I. texanus* and *Hunterellus hookeri* How. in the laboratory, there are no striking biological differences.

Technique for routine and experimental feeding of certain ixodid ticks on guinea pigs and rabbits, W. L. Jellison and C. B. Philip (*Pub. Health Rpts.* [U.S.], *48* (*1933*), *No. 35*, *pp. 1081, 1082, pls. 2*).—A method devised by the authors in the course of studies at the field station at Hamilton, Mont., is described and illustrated.

Maori mite control, W. A. T. Summerville (*Queensland Agr. Jour.*, *40* (*1933*), *No. 5*, *pp. 379–381*).—This note relates to a mite common in the Queensland citrus groves which causes the skin blemish known as "maori", against which both sulfur and lime-sulfur are effective.

ANIMAL PRODUCTION

The nutritive value of alfalfa leaves and stems, J. Sotola (*Jour. Agr. Res.* [U.S.], *47* (*1933*), *No. 12*, *pp. 919–945*).—Continuing the investigations with alfalfa hay (E.S.R., 66, p. 762) at the Washington Experiment Station, these experiments were planned to measure any existing differences in three cuttings of alfalfa hay or their stems and leaves so far as feeding value was concerned. The digestibility of the nutrients was determined in trials with lambs.

The results of 10 experiments with the three cuttings of alfalfa showed that from 67 to 83 percent of the total protein of the plant was contained in the leaves, as well as 71 to 85 percent of the calcium and 48 to 70 percent of the phosphorus. The average coefficients of apparent digestibility for

stems, whole hay, and leaves, respectively, were as follows: Dry matter 46.6, 56.3, and 66.3; crude protein 51.1, 69.7, and 77.4; crude fiber 39, 40, and 55.5; fat 47.9, 24, and 29.7; and nitrogen-free extract 58.9, 71, and 75.9. A given weight of leaves was almost 3.6 times as efficient in supplying digestible protein as an equal weight of stems. The average percentage of digestible nutrients in the stems, whole hay, and leaves was 4.2 crude protein and 41.6 total digestible nutrients in the stems, 9.8 crude protein and 48.4 total digestible nutrients in the whole hay, and 14.9 crude protein and 57.8 total digestible nutrients in the leaves. The storage of nitrogen was 5.2 percent when stems were fed, 17 percent when whole hay was fed, and 16.3 percent when leaves were fed. The weighted averages of the biological values of the proteins from the three cuttings were for stems 64, whole hay 51, and leaves 41.

Lambs fed stems of the three cuttings consumed during a 10-day period a total of 49.2 g of calcium and 7.8 g of phosphorus, and retained 1.3 g of calcium and 0.5 g of phosphorus. When whole hay was fed the intake was 131.7 g and 13.2 g, and the retention was 14 g and 4 g of calcium and phosphorus, respectively. The corresponding figures for leaves were 181.6 g and 14.5 g intake and 24.2 g and 7.3 g retention. These figures led to the conclusion that alfalfa leaves were important sources of calcium and phosphorus.

Protein in pasture grass, C. B. Bender (*N.J. Agr., 15 (1933), No. 6, pp. 3, 4*).—An analysis of grasses showed that their protein content remained fairly constant regardless of the nitrogen fertilizer treatment when the grass was cut at the same heights. Grasses cut at different stages of maturity varied in protein values from 8 to 24 percent on a dry-matter basis. Grass cut at an average height of 5 to 7 in. had an average protein content of 17.1 percent. Pasturing dairy cows on the rotation-management system, when the grass was the correct height, insured the feeding of a watery concentrate instead of a roughage. Following this method brought about a marked increase in the economy of body gains and milk produced as compared with the extensive type of pasture.

Cystine deficiency of soybean protein at various levels, in a purified ration and as a supplement to corn, C. L. Shrewsbury and J. W. Bratzler (*Jour. Agr. Res. [U.S.], 47 (1933), No. 11, pp. 889–895*).—The Indiana Experiment Station undertook a study designed to determine whether soybean protein was deficient when fed at a 10 percent level, whether a cystine deficiency existed at a protein level of 15 percent, and whether a ration made up of corn and soybeans would exhibit a cystine deficiency. The paired-feeding method was used in two tests. In one of these the feed consumption was equalized, while in the other the animals (rats) had unrestricted access to the feed.

Soybean protein (ether-extracted soybeans) was found to be definitely deficient in cystine when the protein was fed at either a 10 or a 15 percent level in a purified ration. A diet of corn, soybean protein, and minerals was not improved by the addition of L-cystine. This study demonstrated the value of the paired-feeding method in which feed consumption was equalized as a means of determining amino acid deficiency.

Important sugar-beet byproducts and their utilization, A. W. Skuderna and E. W. Sheets (*U.S. Dept. Agr., Farmers' Bul. 1718 (1934), pp. II+29, figs. 8*).—This is a revision of and supersedes Farmers' Bulletin 1095 (E.S.R., 42, p. 370).

The quality factor in feeding stuffs, J. A. Murray (*Jour. Agr. Sci. [England], 23 (1933), No. 2, pp. 185–195*).—In this article the author divides the nutritive values of feeds into two factors, quantity and quality, for the purpose of discussion. The former is represented by gross energy and the latter by

organic matter. Since the gross energy of the total organic matter in vegetable feeding stuffs is practically the same except in the case of those rich in oil and protein, the coefficient may be applied directly to the total organic matter. Subject to correction in the case of cakes, the nutritive value may be expressed as available organic matter, $D-0.35T$. The terms can be translated into energy values or starch equivalents by multiplication. The author's method shows that the nutritive value of the total organic matter depends almost entirely upon its digestibility and, except in the case of cakes, only to a slight extent upon the chemical composition of the feed.

Determinations of the digestibility of the feeding stuffs used by the institute during 1908–32 [trans. title], H. ISAACHSEN and O. ULVESLI (*Meld. Norges Landbr. Høiskole, 13 (1933), No. 9, pp. 675–738, figs. 3; Eng. abs., pp. 734–736*).—The methods used in determining the digestibility of the nutrients of feeding stuffs with sheep and goats at the Institute of Animal Nutrition of the Royal Agricultural College of Norway are described. The results of these digestion trials showing the digestibility of the nutrients on many concentrates and roughages, together with the computed feeding values of each feed, are reported.

Estimating statistically the significance of differences in comparative feeding trials, E. W. CRAMPTON (*Sci. Agr., 13 (1932), No. 1, pp. 16–25, figs. 7; Fr. abs., p. 68*).—In this article from Macdonald College the author discusses the various methods for calculating the significance of differences obtained in comparative feeding trials.

The respiration calorimeter, W. W. BRAMAN (*Pennsylvania Sta. Bul. 302 (1933), pp. 36, figs. 25*).—This bulletin contains a description of the construction and operation of the respiration calorimeter for the larger farm animals at Pennsylvania State College.

Some details of muscle structure revealed by salt extraction, H. N. BAKER, H. C. MCPHEE, and P. E. HOWE (*Jour. Agr. Res. [U.S.], 47 (1933), No. 12, pp. 1009–1014, figs. 4*).—In this paper from the U.S.D.A. Bureau of Animal Industry, a technic is described for removing the proteins from muscles followed by a microscopic examination of the extracted tissue.

Muscles from which 60 to 80 percent of the nitrogen had been removed by extraction with sodium chloride and mixtures of monopotassium and dipotassium phosphates showed that the removal of the soluble proteins did not result in any material damage to the remaining structures. During sodium chloride examination in many cases the fibrils completely disappeared, leaving a swollen rind of sarcolemma. Sections of muscle extracted by sodium chloride and by phosphate mixtures were characteristically different in appearance, and in a general way the differences agreed with the quantity of proteins removed.

Supply of phosphates to stock through the drinking-water, B. C. ASTON (*New Zeal. Jour. Agr., 46 (1933), No. 6, pp. 345, 346, fig. 1*).—In this article from the Department of Agriculture of New Zealand the author describes a method for giving mineral foods to stock through the drinking water.

[Experiments with livestock in Michigan] (*Michigan Sta. Rpt. 1932, pp. 169–171, 207, 210, 249–251*).—This report includes data obtained in studies on rations for fattening lambs; a comparison of shelled corn, ground barley, and ground oats as a grain for fattening baby beef calves; the value of various combinations of corn, barley, oats, and tankage for fattening spring pigs on rape pasture, all by G. A. Brown; limited compared with liberal rations for the development of draft colts, by R. S. Hudson; the value of a high protein grower as compared with that of a low protein grower for starting chicks, a comparison of barley and corn in the laying ration, the mineral requirements

of the laying hen, and the value of heat for increasing winter egg production of pullets, all by C. G. Card; the relation of chick rations to slipped tendons, by E. J. Miller; and the antidotal effect of yeast toward gossyhol poisoning in pigs and rats, by E. L. Anthony.

The feeding of livestock, A. G. Hogan (*Missouri Sta. Bul. 330 (1933), pp. 36, figs. 8*).—This is a handbook designed to assist, on the basis of present knowledge of feeds, in providing a ration that is most suitable and most economical under a given set of circumstances. The text is divided into the following main headings: The composition of feeds, the composition of the animal body, the function of feeds, the value of an analysis, vitamins, guides in feeding, estimating the value of a feed, the preparation of feeds, special properties of feeds, and fertilizer constituents of feeds.

[Livestock experiments in South Carolina] (*South Carolina Sta. Rpt. 1933, pp. 32, 33, 34, 109–116, 124–126, figs. 3*).—Data obtained in tests with swine are reported on a study of the influence of green summer forage crops when fed with corn and fish meal free choice on the hardness of fat in hogs, by E. G. Godbey and L. V. Starkey; rations for fattening hogs on green barley and a comparison of green barley and green rye as forage crops for fattening hogs, both by Godbey; and a comparison of winter forage crops and a comparison of summer forage crops for fattening hogs at the Coast Substation, both by E. D. Kyzer and T. M. Clyburn.

Beef cattle tests yielded information on shortening the winter feeding period of purebred Hereford cows, by Starkey; and a study of the effect of minerals (calcium and phosphorus) on the growth and breeding qualities of beef cattle at the Coast Substation, by Clyburn and Kyzer.

Studies with poultry included feeding experiments with laying hens, simple v. complex rations for starting chicks, artificial lights for layers, and poultry housing experiments, all by C. L. Morgan; vegetable proteins in laying and breeding rations, value of dried milk in a standard meat scrap laying mash, value of dried whey in a standard meat scrap mash, value of alfalfa leaf meal and green feed as supplements to the laying mash, value of ground oats to replace one half of the yellow corn of the laying mash, and complex v. simple laying mash.

Efficiency variations in steers: A proposed record of performance, L. M. Winters and H. McMahon (*Minnesota Sta. Tech. Bul. 94 (1933), pp. 28*).—A series of experimental feeding trials was conducted to determine (1) whether the variations in efficiency of feed utilization by steers of a given age and market grade were of sufficient magnitude to be of economic importance to the livestock producer, (2) methods of feeding and handling that would make accurate feed records possible and provide conditions as favorable as those of lot feeding, (3) characteristics that would indicate efficient animals, and (4) the formulation of a record of performance program to aid in the development of more economical strains of beef cattle.

It was found that steers of the same breeding, age, weight, market value, and condition exhibited differences of sufficient magnitude in their ability to make economical gains to be of importance to the producer. A 4-month feeding test was as short as could be recommended to obtain each animal's relative efficiency. Feed consumption on the basis of average body weight was not a satisfactory indication of an animal's feed efficiency or of its net profit.

The most satisfactory indicator of efficient feed utilization (X) was a modification of an equation previously reported (E.S.R., 70, p. 420). This factor showed a significant correlation with net profit (A), $r_{ax}=0.5155$. The significant indicators of net profit were daily rate of gain (D) and final market

valuations (*S*), namely, $r_{ad}=0.8072$ and $r_{as}=0.8231$, respectively. Together these accounted for 87.3 percent of the variations in the net profit of 32 steers. Daily rate of gain and the efficiency factor were so closely correlated ($r_{de}=0.7141$) that the relationship of efficiency with net profit was apparently being cared for by the daily rate of gain.

A tentative record of performance is suggested, based on the rate of gain and body score as indexes from which to calculate the value of the animals tested. The final value (*V*) derived from daily rate of gain and market valuation gave a correlation coefficient of 0.9064 with net profit.

Varying amounts of cottonseed hulls and sorghum silage for finishing mature steers, R. H. Means (*Mississippi Sta. Bul. 301 (1933), pp. 8, figs. 4*).—A series of three experiments lasting 106, 99, and 120 days, respectively, was undertaken to compare the feeding value of cottonseed hulls and sorghum silage when fed alone with varying mixtures of sorghum silage and cottonseed hulls for fattening mature steers. In all trials each of the four lots received cottonseed meal 5 to 7 lb. and Johnson grass hay 3 lb. In addition the repective lots received sorghum silage ad libitum, sorghum silage and cottonseed hulls 3:1 ad libitum, sorghum silage and cottonseed hulls 1:1 ad libitum; and cottonseed hulls ad libitum. The average daily gains for the three tests were 1.5, 1.7, 1.7, and 1.5 lb. per steer.

On the basis of the ration fed in lot 2 in all tests 1,000 lb. of cottonseed hulls replaced 125 lb. of cottonseed meal, 2,459.6 lb. of silage, and 60.7 lb. of hay. When equal parts of silage and hulls were fed, 1,000 lb. of cottonseed hulls replaced 57.6 lb. of cottonseed meal, 2,230.5 lb. of silage, and 27.9 lb. of hay. When cottonseed hulls were fed alone, 1,000 lb. of hulls replaced 10.5 lb. of cottonseed meal, 2,180.1 lb. of silage, and 4.6 lb. of hay. Based on the average of the three tests, the selling price per 100 lb. was highest in lot 3 and lowest in lot 1.

Stiffs or sweeny (phosphorus deficiency) in cattle, R. B. Becker, W. M. Neal, and A. L. Shealy (*Florida Sta. Bul. 264 (1933), pp. 27, figs. 12*).—The condition known as stiffs or sweeny (E.S.R., 70, p. 221) was caused primarily by a shortage of phosphorus in the forages consumed. Affected cattle showed a subnormal content of inorganic phosphorus in the blood plasma, a condition which was alleviated by consumption of bone meal. There seemed to be little possibility that calcium was sufficiently deficient in the forages to be a primary causative agent of this condition.

Weaning the calf of a stiff cow permitted the phosphorus of the blood plasma to increase. Steers and heifers had a higher plasma phosphorus than either dry or nursing cows. The latter suffered in proportion to the drain for milk production. Internal parasites lowered the condition of the animals and increased the economic losses, but were secondary rather than primary causes of stiffness. The withdrawal of mineral matter from the skeleton of stiff animals weakened the bones, and the articular surfaces of the joints often eroded or even broke through leaving the animal either temporarily or permanently crippled. The level of phosphorus deficiency may become so low as to decrease the efficiency of food utilization. Regular and continuous access to finely ground bone meal prevented or overcame sweeny or stiffs.

Practical sheep-farming, T. C. Norris (*London: George Allen & Unwin, [1933], pp. 229, pls. 6, figs. 8*).—The author of this treatise has compiled information based on practical experience on the best methods of handling sheep and wool under range conditions.

Comparison of Rambouillet, Corriedale, and Columbia sheep under Intermountain range conditions, J. M. Cooper and J. A. Spencer (*U.S. Dept. Agr. Circ. 308 (1934), pp. 16, figs. 6*).—The data reported, mainly from work

carried on at the U.S. Sheep Experiment Station in Idaho, were based on records maintained over a period of 8 yr., 1924–31, and were gathered to answer the question, "How does the production of the Corriedale and Columbia compare with that of the Rambouillet?"

In body weight in the fall mature ewes of the Rambouillet, Corriedale, and Columbia breeds varied from 116 to 129, 106 to 122, and 123 to 141 lb., respectively. Rambouillets produced approximately 99 lambs per 100 ewes, Corriedales 102, and Columbias 106, and the respective breeds weaned about 72, 85, and 78 lambs, averaging 71, 69, and 77 lb. per head. Rambouillets produced the smallest number of pounds of lamb per 100 ewes because of the small number of lambs weaned, while the Corriedales were high in this respect because of the large numbers weaned and the Columbias were also high due to the high weaning weight per lamb.

Mature Rambouillet ewes averaged 11.7 lb. of fine-medium and half-blood quality grease wool, Corriedales 9.6 lb. of three-eighths-blood quality, and Columbias 11.7 lb. of quarter-blood quality. The average staple lengths for the respective breeds were 2.3, 3.4, and 3.4 in. In terms of clean wool the yields were 4.8, 4.7, and 5.9 lb., respectively. The percentage of dead or missing ewes was 6.3, 7.8, and 8.7 for the respective breeds. Size and wool production of yearling ewes of each breed followed the trend for mature ewes.

Under the conditions of this experiment, Rambouillets produced desirable lambs for stocking and feeding purposes; Corriedale lambs that were in good demand for restocking, slaughtering, and feeding purposes; and Columbias rapidly growing lambs that finished at rather heavy weights.

Fibre growth phases in a sample of Australian Merino wool, J. E. Nichols (*Jour. Textile Inst., 24 (1933), No. 9, pp. 333–340, pl. 1, figs. 3*).—In a study at the Wool Industries Research Association, England, it was found that the wool follicle displays great flexibility in the manner of its response to conditions affecting its rate of activity. It also continues to maintain the production of fiber material under wide changes of metabolism.

A detailed analysis of an Australian Merino sample showed two well-defined changes in character and quality along the staple. The rate of elaboration of fiber substance during these changes varied greatly in terms of mean volume per month. This production was 27 percent less during the second period than during the first, and 109 percent greater in the third than in the second period. During these different levels of production, length-rate and thickness did not share in the same proportions at each "break." These results emphasize the desirability of considering both thickness change and altered rate of length increase and of assessing the relative importance of their contribution to the expression of follicle activity.

Lamb fattening trials, D. J. Griswold (*North Dakota Sta. Bul. 274 (1933), pp. 28, figs. 2*).—A series of four trials with lambs was undertaken to study the feeding value of various seeds and grains commonly found in grain screenings in North Dakota.

In the first trial pigeon grass (*Chaetochloa glauca*) seed was found to be practically equal to barley when fed as 40 percent of the grain ration. When substituted for all of the barley this seed reduced the daily gains 22 percent, increased the grain required per unit of gain 42 percent, and increased the hay requirement 22 percent. However, even in the case where pigeon grass seed replaced all the barley, satisfactory gains were produced, and had the feeding period been longer the finish attained would probably have been the same as in the lot receiving barley.

Wild oats that were plump, well filled, heavy, and free from awns or beards were found, in the second trial, to be a valuable feed for lambs. When

fed as 40 percent of the concentrate mixture they were almost equal to barley, but in larger amounts lost a good part of their feeding value. The wild oats were almost as valuable as cultivated oats.

It was found in the third trial that when barley was supplemented with either 5 or 10 percent linseed meal it produced slightly greater daily gains than when supplemented with 20 percent bran. Sweetclover hulls had almost the same value as bran as a supplement to barley. Ground kinghead was very unsatisfactory when fed as 80 percent of the concentrate ration, but at a 40 percent level produced fairly satisfactory results.

In the fourth trial lambs receiving either 10 or 20 percent of sweetclover seed hulls in addition to the barley required less feed per unit of gain than those receiving wheat bran. On the average, however, it was concluded that these two feeds were practically equal.

Statistical data concerning the pig stock used for experiments [trans. title], M. Husby (*Meld. Norges Landbr. Høiskole, 13 (1933), No. 9, pp. 583–674, figs. 29; Eng. abs., pp. 668–673*).—Observations and data obtained over a period of 8 yr. are reported on the feeding and management of suckling pigs, the mortality rate of pigs from birth to weaning, the rate of growth from birth to 26 weeks of age, the effect of inheritance on the growth of pigs, the average length of the gestation period, and the effect of adding iron and copper salts to the ration of pregnant sows and suckling pigs.

Feeding pigs without protein supplement and with various packing house by-products, E. F. Ferrin (*Swine World, 21 (1933), No. 2, p. 10*).—In a test at the Minnesota Experiment Station four lots of eight pigs each, averaging approximately 57.7 lb. per head, were fed for 90 days on a basal ration of shelled corn hand-fed twice daily. During the first 45 days of the test the pigs were on rape pasture and had free access to a mineral supplement. In addition the respective rations had the following supplements added—none, 60 percent tankage, 50 percent meat and bone scrap, and 68 percent beef meal.

The average daily gains were 0.8, 1.1, 1.2, and 1.3 lb. per head, respectively. The pigs in lot 1 gained slowly and were in a thin condition at the end of the feeding period, and the feed cost per unit of gain was also higher than in any of the other lots. The pigs in lot 3 made slightly faster gains than those in lot 2, but the cost of gain was practically the same in both lots. The beef meal fed in lot 4 made the best showing, both in rate and economy of gain. However, this is not a commercial feed and is not available on the market.

Cane molasses as a supplement to fattening rations for swine, L. A. Henke (*Hawaii Sta. Bul. 69 (1933), pp. 11*).—A series of four tests was conducted with a total of 51 pigs having an initial weight ranging from 50 to 100 lb. per head to determine the value of cane molasses. All lots were self-fed in dry lot and received in addition to the grain ration 1 lb. of green alfalfa per head daily.

In amounts up to 20 percent of the grain ration, cane molasses was worth as much pound for pound as rolled barley for fattening swine. In all but one test the addition of molasses up to 20 percent increased the rate and economy of gains. The molasses mixtures were quite palatable, and no bad physiological effects were observed. The feces of the lots fed molasses were darker and softer than in the control lots.

Three types of breeding hens, W. C. Thompson (*N.J. Agr., 15 (1933), No. 6, pp. 6, 7*).—In this article the author describes the characteristics of three types of hens based upon the individual weight of the eggs produced by them.

The position of dry skim milk in poultry feeding, C. W. Sievert (*U.S. Egg and Poultry Mag., 39 (1933), No. 8, pp. 42–44, 63, fig. 1*).—In this study, conducted at a large poultry-fattening plant, dry skim milk, condensed butter-

milk, and condensed cultured skim milk were compared as to their value in a poultry-fattening ration.

It was found that dry skim milk was comparable with other milk sources on the basis of milk solids contained as a source of milk for poultry fattening. The gains produced and the feed consumption were comparable in all lots. The quality of the poultry produced by feeding dry skim milk was equal to that produced by other forms of milk.

Meat production in poultry, W. A. Maw (*U.S. Egg and Poultry Mag., 39 (1933), No. 7, pp. 18–47, figs. 20*).—This is a preliminary report of a study at Macdonald College to determine whether there is any relationship between "body type", as designating difference in body measurements, and the rate of growth and amount of edible meat on the carcass of the bird. Broilers at 10 weeks of age and roasters at 26 weeks of age from different types of birds, represented by pure breeds and certain crossbreeds, were studied.

At 10 weeks of age Cornish × Barred Rocks and Leghorns × White Rocks averaged heavier than Barred Rocks, Rhode Island Reds, Wyandottes, and White Leghorns, while Buff Orpingtons were as heavy as the heaviest crossbreeds. As roasters at the 4-lb. weight, the Leghorn × White Rock cross reached this weight at 14 weeks, while the Rhode Island Reds and the Barred Rocks required 15 and 16 weeks, respectively, and Leghorns 22 weeks to reach this weight.

To 10 weeks of age the Wyandottes and Rhode Island Reds gained 35 and 34.3 g live weight for each 100 g of feed consumed. Barred Rocks ranked eighth with 28.6 g gain and Leghorns last with 28.2 g gain per 100 g of feed. As roasters the Barred Rocks gained 11.6 g per 100 g of feed consumed, with the Wyandotte × Leghorn cross second, Rhode Island Reds third, and Leghorns last in this respect.

The crossbreeds excelled the pure breeds with the exception of the Wyandotte for percentage of edible flesh on the dressed carcass as broilers. The Leghorn × Rhode Island Reds ranked highest and the Rhode Island Red × Leghorn lowest in this respect. As roasters the Cornish ranked first, the Cornish × Barred Rock second, and the Barred Rocks third. No definite relationship between body measurements and percentage of edible flesh on carcass was found. There was a general tendency with crossbreeds between light and general-purpose types to follow the body shape of the light type.

Scientific and modern chick rearing and battery brooding, M. J. Rowlands (*London: Poultry World Ltd., [1932], pp. X+172, pls. 20*).—This treatise, based on the experience of the author and on the practical knowledge of poultry farmers, is designed as a handbook on chicken rearing and battery brooding. Information is given on the process of digestion, foods and their functions, management of battery brooders, coccidiosis and other diseases to which chickens are prone, and the prevention or cure of these diseases.

Factors in the development of deforming leg weakness in chickens, R. T. Parkhurst and M. R. McMurray (*Jour. Agr. Sci. [England], 23 (1933), No. 2, pp. 311–327, pl. 1*).—In an experiment at the National Institute of Poultry Husbandry, observations were made on the leg condition of 12 groups of chicks during 1930–31 and on the same number during 1931–32.

It was found that abnormal leg trouble or perosis occurred in chicks receiving an excessive amount of meat and bone meal, and rarely was manifested when the bone meal content of the ration was low or absent. Battery brooders intensified bone deformities, especially when the mineral balance of the ration was unsatisfactory. The amount of floor space allowed per bird was not a factor in the development of perosis. In this study slipped tendon was not

caused by adding calcium carbonate (ground limestone) to the ration. The protein content of the ration and the growth rate did not materially affect the occurrence of perosis. Since there were fewer crooked toes in the brooder house than in batteries it appeared that wire floors might be a contributing factor. On the basis of the results obtained, it was concluded that crooked toes could not be associated with any definite nutritional factor.

The nature of the calcium and phosphorus combination in the excreta of the non-laying pullet, F. Knowles, J. E. Watkin, and F. W. F. Hendry (*Jour. Agr. Sci.* [*England*], *23* (*1933*), *No. 2, pp. 196–203*).—In this test at the East Anglian Institute of Agriculture, eight White Wyandotte pullets were fed three rations which differed only in the amounts of calcium and phosphorus supplied in various combinations. The birds were fed separately in metabolism cages, and the excreta were collected with a minimum contamination by particles of food.

From the results obtained it was concluded that, in the case of a ration containing adequate amounts of calcium carbonate, the normal form in which phosphorus was excreted by the nonlaying pullet was as dicalcium phosphate. Any excess of calcium needed over the amount required for the formation of the above compound was excreted as calcium carbonate.

Osmotic relationships in the hen's egg, J. M. Johlin (*Jour. Gen. Physiol.*, *16* (*1933*), *No. 4, pp. 605–613*).—In this article the author presents data to illustrate the difficulties met in obtaining consistent freezing point data with the yolk of the hen's egg. A technic is described for obtaining reproducible and accurate results consistently.

The data showed a pronounced difference between the freezing points of the yolk and the white. The freezing point determination showed that even in a mixture of yolk and white osmotic equilibrium was arrived at slowly.

The influence of additions of iodine on the egg production of two-year-old hens before, during, and after molt [trans. title], W. Klein (*Arch. Geflügelk.*, *7* (*1933*), *No. 3, pp. 65–74, figs. 4; Eng. abs., p. 74; abs. in Harper Adams Util. Poultry Jour.*, *18* (*1932–33*), *No. 9, pp. 400–402*).—In a series of studies at the Agricultural High School at Bonn-Poppelsdorf, Germany, a special iodized cod-liver oil marketed under the name of Iocol was fed to chickens of different ages. The chicks receiving iodine showed a more rapid development of the comb, making it possible to pick out males about a week earlier than in the control groups. No injurious effects were noted on body development. In the case of two-year-old hens the iodized birds started to molt at the same time as the controls but shed their old feathers and grew the new feathers more quickly. During the molting period the iodized birds showed greater activity and spirit and redder combs and wattles than the controls. The body temperature was also about 0.5° F. higher in the iodized group. In the case of about 20 percent of the iodized hens the comb became smaller but did not lose its firmness and fine red color. Egg production was a great deal higher in the iodized group than in the control group, but in spite of heavy laying the iodized birds kept in good body condition.

The vitamin D potency of egg yolk from irradiated hens, G. H. and E. Maughan (*Science*, *77* (*1933*), *No. 1990, p. 198*).—The relative antirachitic potency of egg yolk from irradiated hens was tested in five experiments at the [New York] Cornell Experiment Station. Eggs were tested from a flock receiving both cod-liver oil and ultraviolet rays, a flock receiving cod-liver oil, and a farm flock receiving a poorly balanced ration.

The results confirmed previous investigations showing that egg yolk contained appreciable amounts of vitamin D. Irradiating hens with ultraviolet rays mark-

edly increased this vitamin above the quantity normally found in eggs. Rachitic rats fed a ration containing 5 percent of egg yolk from irradiated hens were cured as rapidly as similar rats exposed to ultraviolet light. Ten percent of this egg yolk was as effective in a rachitogenic diet as 0.5 percent of cod-liver oil. Nonirradiated hens having access to autumn sunshine produced egg yolks with sufficient vitamin D to cure rickets. However, as the winter advanced and the length of the production period increased, the vitamin D content of the eggs diminished to a low level. There appeared to be a limited ability for hens to store vitamin D and transfer it to the eggs. The tests with the farm flocks showed that eggs as ordinarily purchased contained varying amounts of vitamin D. The season of the year and volume of production were at least two factors determining these amounts.

Effect of washing on the keeping quality of hens' eggs, R. L. Bryant and P. F. Sharp (*Jour. Agr. Res.* [U.S.], *48 (1934), No. 1, pp. 67–89, figs. 6*).—The data reported in this paper from the [New York] Cornell Experiment Station were obtained in a study designed to determine the effect on the keeping quality of eggs of washing and of the type of solution used in washing. A few comparisons were also made between cleaning by washing and by dry abrasion.

Eggs that had been washed with a number of different solutions did not lose weight more rapidly during storage at high temperatures than did unwashed eggs. Oil-dipped eggs lost less weight in storage than did eggs that were not oil-dipped. Loss in weight up to 7 percent was shown to be a linear function of time, at constant humidity and temperature, and was not influenced by washing. A correlation of $+0.45 \pm 0.057$ was found between the number of pores in the eggshell and the loss in weight of the egg and a correlation of $+0.258 \pm 0.063$ between the number of pores and shell strength. Cleaning by sand blast increased the porosity and rate of loss in weight.

The possibility of infection from bacteria through the relatively few large pores of the shell is pointed out. Germicidal action of egg white having a high pH value was shown at temperatures from 0° to 40° C. It was concluded that deterioration of washed eggs was due to bacterial infection of the egg from the dirt on the shell, and that subsequent washing did not reach the organism which had already entered the egg. The only effective remedy lay in preventing eggs from becoming dirty.

Turkey feeding experiments (*[Connecticut] Storrs Sta. Bul. 192 (1933), p. 15*).—The results of a comparison of a manufactured turkey feed and a ration recommended by the New England Conference Feed Board for growing poults are reported.

Rape pasture for turkey poults, O. A. Barton (*U.S. Egg and Poultry Mag., 39 (1933), No. 10, pp. 26, 59*).—Preliminary work at the North Dakota Experiment Station showed that the average weight of male poults grown to 24 weeks of age on a rape pasture was 15.4 lb., compared with average weights of 15.8, 14.2, 15, and 16.7 lb., respectively, for four lots of male poults on alfalfa range. The average weight of female poults grown on rape was 10.7 lb. at 24 weeks of age, compared with 10.9, 10.9, 10.8, and 10.7 lb. for four lots on alfalfa. The average feed cost per pound of live turkey was 5.1 ct. for the lot grown on rape pasture and 4.4, 5.2, 5, and 5 ct., respectively, for the lots on alfalfa. These results show very favorable results with rape and indicate that it may be used as a substitute or supplement for alfalfa range.

Turkey production, L. E. Cline (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench Trubner & Co., 1933, rev. ed., pp. XVIII+436, figs. 114*).—This is a revised and enlarged edition of the treatise previously noted (E.S.R., 60, p. 861).

DAIRY FARMING—DAIRYING

Feeding and management investigations at the United States Dairy Experiment Station at Beltsville, Md.; 1932 report, T. E. Woodward, J. B. Shepherd, and R. R. Graves (*U.S. Dept. Agr., Misc. Pub. 179 (1933), pp. 51, figs. 7*).—Continuing previous work (E.S.R., 66, p 862), data obtained in studies with dairy cattle are reported on feeding cottonseed meal to young calves and to older calves, feeding old-process linseed meal to young calves, feeding young calves on milk from cows receiving cottonseed meal, feeding cottonseed meal and wheat straw to dairy cows, feeding skim milk to cows and heifers, the digestion of green grass and hay by dairy cows, a comparison of the effect of the condition of the cow at calving time on production and feed consumption, comparison of peat moss, wheat straw, wood shavings, and buckwheat hulls as bedding materials for dairy cattle, grooming dairy cows by hand as compared with grooming by means of a vacuum cleaner, and the use of pastures in milk production.

[Experiments with dairy cattle and dairy products] (*[Connecticut] Storrs Sta. Bul. 192 (1933), pp. 11, 12, 13*).—Results are reported on cardboard flavor in milk, the effect of machine grooming on yield, and succulence in the dairy ration.

[Studies with dairy cattle and dairy products], E. L. Anthony (*Michigan Sta. Rpt. 1932, pp. 209–212*).—Preliminary results of experiments with dairy cattle are reported on feeding concentrates alone to calves, feeding gossypol in raw cottonseed to dairy heifers, and simple v. complex rations for milk production.

Dairy products studies included data on the effect of acidity of cream on keeping quality of butter, the effects of butter, condensed milk, and skim milk powder in ice cream, relative effects of aging periods on ice cream mixes, factors which affect clean milk production, milk serum separation from bottled cream, gelatin substitutes as stabilizers for ice cream, manufacture of the granular type of buttermilk, and the viscolization of milk.

[Experiments with dairy cattle in South Carolina], J. P. LaMaster, E. C. Elting, J. H. Mitchell, and E. W Faires (*South Carolina Sta. Rpt. 1933, pp. 53, 54, 56–65, 164, 165, figs. 2*).—The tests with dairy cattle yielded information on the value of ground corn fodder as the only roughage for milking cows, grazing test on Bermuda pasture with milking cows, seasonal variation in the composition of a Bermuda pasture sod, the composition and feed value of hop clover, a study of calcium and phosphorus assimilation by dairy cows, fertility studies based on the record of the station dairy herd, and the development of a year-round grazing system for dairy cows at the Sandhill Substation.

The nutritive value of proteins for milk production.—II, A comparison of the proteins of blood meal, pea meal, decorticated earth-nut cake, and a mixture of decorticated earth-nut cake and flaked maize, S. Morris and N. C. Wright (*Jour. Dairy Res. [London], 5 (1933), No. 1, pp. 1–14, figs. 4*).—Continuing this study (E.S.R., 70, p. 82), it was found that when minimal quantities of protein were fed to milking cows a deficiency of either lysine or tryptophane led to a marked decrease in milk yield. There was some evidence of the storage of reserve nitrogen which could be utilized when the food protein was inadequate. Feeding a ration low in these amino acids caused a marked increase in urinary nitrogen while adequate quantities reduced the urinary nitrogen, thus reflecting the efficiency of protein utilization.

The utilization of body tissue in an effort to maintain normal milk flow on a protein-deficient diet was shown by the high creatine excretion and confirmed by the fact that the sulfur-nitrogen ratio excreted during this period

approximated that of body tissue. There were indications that the percentage of urea nitrogen and of ammonia nitrogen increased on the deficient protein diet. It was possible to show that when minimal quantities of protein were fed, the absorption of nitrogen from, or the reexcretion of nitrogen into, the digestive tract depended largely upon the quality of the protein ingested.

Because of marked variations of nitrogen balances, not only while on different rations but during different periods on the same ration, these data cannot be used to measure the utilization of food protein. The authors devised a new formula for calculating the relative biological value of different proteins for milk production. The values given in this report refer to the feeds supplemented by oats and fed with a maintenance ration of constant composition. There was a close correlation between the biological value of the ration and its content of lysine or tryptophane.

The influence of artificially dried grass in the winter ration of the dairy cow on the colour and vitamin A and D contents of butter, S. J. Watson, J. C. Drummond, I. M. Heilbron, and R. A. Morton (*Empire Jour. Expt. Agr., 1 (1933), No. 1, pp. 68–81, figs. 2*).—An experiment was carried out during the winter of 1931–32 with four groups of cows at the Agricultural Research Station, Jealott's Hill, Berkshire, to measure the effect of two types of artificially dried grass and of grass silage on the quality of winter butter and on the production and composition of milk as compared with a normal winter ration.

The yellow color of the butter (which is closely correlated with its carotene and vitamin A content) of the cows on the usual type of ration fell to a very low level during the winter and rose again when the cows were turned on pasture in the spring. Adding grass silage during the winter months did not materially affect the total yellow color. Artificially dried nonnitrogen-treated grass fed during the winter kept the butter color at a considerably higher level but not up to that of butter produced on pasture. Artificially dried nitrogen-treated grass kept the yellow color at a high level during the winter. The Reichert-Wollny and Polenske values of the butter were similar in all lots. The vitamin D content of the butter of all lots was low during the winter.

The amount and composition of the milk produced were unaffected by the different diets, although there were indications that the artificially dried nitrogen-treated grass maintained the calcium content of the milk at a higher level in the winter period.

It is concluded that it would be possible by the inclusion of the correct amount of artificially dried grass in the winter ration of dairy cows to produce butter equal in color and vitamin A content to butter produced in summer by grass-fed cows.

The energy metabolism of phosphorus-deficient dairy cattle, W. H. Riddell, J. S. Hughes, and J. B. Fitch (*Amer. Jour. Physiol., 106 (1933), No. 3, pp. 676–681, fig. 1*).—Using the portable metabolism apparatus to determine oxygen consumption, the Kansas Experiment Station found that dairy cattle have a higher energy metabolism during advanced stages of aphosphorosis than while in a normal condition.

Inheritance of fat percentage, J. W. Bartlett (*Holstein-Friesian World, 30 (1933), No. 16, pp. 7–9*).—Based on the data published in the Advanced Register Year Book, Vols. 42 and 43, the New Jersey Experiment Stations made a study of the inheritance of fat percentage in Holstein cattle. Only dams with records of 600 lb. fat were used. The data included 2,088 dam-and-daughter pairs.

A slight correlation was found between dam and daughter in the inheritance of butterfat. Only a few bulls uniformly transmitted to their daughters a

fat test above the average of the breed. A number of bulls when bred to known high-testing dams varied widely in their transmitting ability. The transmitting ability of a sire for this factor was indicated by the average fat test of all his daughters. It was found that with the increase in the fat test of all daughters of any particular sire, the test of his daughters out of certain dams increased to a marked degree with the increase in the fat test of these dams.

Dairy chemistry, W. L. DAVIES (*Jour. Dairy Res. [London], 5 (1933), No. 1, pp. 75–99*).—This is a review of the literature dealing with dairy chemistry under the following broad subdivisions: I, The Composition of Milk; II, The Chemistry of Milk Constituents; III, Physical Chemistry of Milk; IV, Milk Products; V, Processing; and VI, Analysis of Milk and Its Products.

[Experiments with dairy products in Michigan], E. D. DEVEREUX (*Michigan Sta. Rpt. 1932, p. 182*).—Results are reported on the effect on bacterial multiplication of chilling and freezing milk for short-time periods prior to storage at room temperature and on the development of a new liquid medium for determining the keeping quality of milk and its application to ice cream and ice cream mixes.

Nineteenth annual report of the creamery license division, T. H. BINNEY (*Indiana Sta. Circ. 198 (1933), pp. 16*).—This is the usual report of the State creamery license division for the year ended March 31, 1933 (E.S.R., 69, p. 104). The comparative annual production of dairy products in Indiana, creamery and glassware inspection, and the examination of testers are discussed.

Effect of a surface cooler on flavor, cream line, and evaporation loss, H. J. LEACH and W. H. MARTIN (*Amer. Creamery and Poultry Prod. Rev., 77 (1933), No. 4, pp. 112, 114, 115, figs. 3*).—The results of an investigation at the Kansas Experiment Station showed that the freezing or partial freezing of milk on the tubes of a surface cooler may result in a reduction in volume of cream and also impair the flavor of the milk. Such factors as rate of flow over the cooler, distance of fall over the cooler, temperature of cooling medium, and temperature to which milk is cooled exerted little influence on flavor and creaming ability. Permitting milk to freeze to the tubes of the cooler or to partially freeze in the bottles reduced the cream volume and brought about a curdled appearance of the cream layer. Such milk generally developed an oxidized, tallowy flavor during storage.

The "cappy" cardboard or oxidized flavor of milk may be due to the introduction of metals or metallic salts during the cooling process. It is suggested that in order to prevent this injurious flavor the cooler should be sterilized with steam, and if chemical sterilizers are used they should be thoroughly rinsed from the cooler before using. While covering the cooler protects milk from contamination during the cooling process, it was not necessary in order to prevent evaporation loss. Shrinkage from evaporation was found to average less than 0.2 percent.

The freezing point—is it specific for pure fresh milk? J. GOLDING (*Jour. Brit. Dairy Farmers' Assoc., 45 (1933), pp. 58–67*).—In this article the author describes the apparatus used for the determination of the freezing point, the method used and its application to watered milk, the disadvantages of the method, and the variations obtained by different workers.

The cryoscopy of South African milk, L. DENIS-NATHAN (*Union So. Africa Dept. Agr. Sci. Bul. 119 (1933), pp. 24*).—This investigation was undertaken in the Government Chemical Laboratories, Capetown, to determine the freezing point of South African milk, how the figures obtained compared

with that found in other countries, and its application as a means of detecting added water.

The Hortvet cryoscope (E.S.R., 45, p. 506) used in determining the freezing point of various types of milk was found to be reliable. The average value of the freezing point of the samples investigated was found to be —0.541° C., with the range lying between —0.528° and —0.561°. The apparatus was also reliable for determining the percentage of added water in milk, and when calculations were based on the average figure given above the addition of water to within 3 percent may be indicated. No evidence was found of the influence of disease or seasonal variation on the freezing point. The effect of preservative on freezing point was studied, and a correction of 0.008° for each 0.1 cc of trikresol per 100 cc of milk was advocated. A correction factor of 0.003° for each 0.01 percent excess lactic acid was also found necessary.

The heat denaturation of albumin and globulin in milk, S. J. Rowland (*Jour. Dairy Res.* [*London*], *5* (*1933*), *No. 1, pp. 46–53, figs. 2*).—An investigation was undertaken at the University of Reading on the amounts of lactalbumin and lactoglobulin denatured by heating portions of the same milk for varying periods at each of several temperatures. A series of samples of milk was heated at temperatures varying from 63° to 80° C. and for periods ranging from 2.5 to 60 min.

The denaturing effect was found to depend on both the temperature and length of heating. An average of 10.4 percent of the total soluble protein of milk was denatured after 30 min. heating at the lowest temperature used. Smooth curves were obtained from the progress of denaturation with time at each temperature, and a relative increase in velocity for each rise in temperature of 1° was found to be constant, the temperature coefficient of the reaction being 1.5.

A study of the action of the proteolytic enzymes of specific organisms upon the proteins of milk and upon gelatine, G. Spitzer, E. H. Parfitt, and W. F. Epple (*Indiana Sta. Bul. 385* (*1933*), *pp. 44, figs. 9*).—Continuing these investigations (E.S.R., 66, p. 44), the object of this study was to determine the proteolytic actions of the enzymes of some of the typical types of microorganisms common to the dairy industry. Studies were conducted with 30 micro-organisms, all of which produced proteolytic enzymes acting on the proteins of both milk and gelatin.

The putrefactive organisms, *Bacillus ichthyosmius* and *Achromobacter putrefaciens* and its related types, produced the most active enzymes. The activity of these enzymes was characterized as tryptic and ereptic, with an optimum pH at 7, the activity diminishing rapidly at pH 4 and 3, and hydrolyzing both milk and gelatin proteins. The action of the enzymes of the *Streptococcus lactis* group was much weaker, especially in the production of peptones, than that of the above group. The enzymes of *Torula cremoris* grown in a medium at pH 6.8 uniformly hydrolyzed the proteins of milk and gelatin, but when grown in a medium at pH 4 the action was much weaker on gelatin. When *B. ichthyosmius* was grown in a medium at pH 6.8 the enzymic action was normal, but at pH 4 there was no action on the proteins of either milk or gelatin. The enzymes of *T. cremoris* plus *Oidium lactis* showed the characteristic properties of yeast and mold proteases when acting on the proteins of milk and gelatin. The optimum pH was at 6 to 7, and an increase of salt caused a gradual diminution of activity. This effect of salt on enzymic action was pronounced. As the concentration of the salt increased the inactivation also increased. Heat inactivated the enzymes of *B. ichthyosmius* in proportion to the temperature and length of the heating period.

Appended is a list of proteolytic organisms and tables giving the results of enzyme action on the proteins of milk and gelatin.

Sulphur, bitter milk, and enzymes, D. H. BAILEY (*Milk Plant Mo., 22 (1933), No. 9, pp. 31, 32*).—The Pennsylvania Experiment Station reports the results of clearing up a case of bitter milk, the cause of which was finally traced to an enzyme originating in the milk of two cows in the herd.

The Burri smear-culture method for the determination of the bacterial content of milk samples, A. CUNNINGHAM and A. ANDREWS (*Jour. Dairy Res. [London], 5 (1933), No. 1, pp. 29–41*).—The College of Agriculture at Edinburgh made a comparison of the accuracy of the ordinary plate and the Burri smear-culture methods (E.S.R., 60, p. 662) for determining the bacterial content of milk samples.

The percentage of error in determinations made by the smear-culture technic was markedly higher than in the determinations made by plating. Evidence is presented to show that the inaccuracy of the Burri method was partially due to errors involved in loop measurements and partly to the inferiority of conditions for growth on slopes as compared with those in plate cultures.

The occurrence of coliform bacteria in milk, J. F. MALCOLM (*Jour. Dairy Res. [London], 5 (1933), No. 1, pp. 15–28, fig. 1*).—The purpose of this investigation at the West of Scotland Agricultural College was (1) to determine the prevalence of coliform bacteria in market milk at different seasons of the year, (2) to correlate their presence with total bacterial content, and (3) to examine the biological reactions of these organisms isolated from milk and to determine, if possible, whether they originated from direct fecal contamination or from external sources.

Of the 21,569 samples of mixed milk obtained under fair conditions of cleanliness and examined by means of the coliform test, 48.3 percent gave negative results with only 1/10, 1/100, and 1/1000 cc amounts, 21.4 percent gave positive results with only 1/10 cc, 14 percent gave positive results with 1/10 and 1/100 cc, and 16.3 percent positive results with 1/10, 1/100, and 1/1000 cc. The proportion of positive samples was higher in summer and early autumn than during the winter and spring, due largely to atmospheric temperature. The positive samples contained on the average 6.3 times as many bacteria as the negative samples. There was a positive correlation between the average bacterial content of the milk, the proportion of coliform-positive samples, and the mean of the minimum and maximum atmospheric temperatures.

Practically 800 strains of coliform bacteria were isolated from the milk samples and the degree of association between certain characters noted. During the winter and spring when the cows were in stables, 71 percent of the strains isolated were of the types which predominate in feces, *Bacillus coli* types, 7.5 percent were *B. lactis aerogenes* types, 8.6 percent of *B. cloacae* types, and 7.8 percent of intermediate types. During the summer and autumn pasture seasons, the isolated strains were 40.4 percent *B. coli*, 22.4 percent *B. lactis aerogenes*, 9.8 percent *B. cloacae*, and 13.5 percent intermediate types. In order of frequency the species of coliform bacteria most frequently found were *B. coli communior*, *B. coli communis*, *B. cloacae*, and *B. lactis aerogenes*.

The effect of common salt on the growth of lactic streptococci in milk, F. H. McDOWALL and L. A. WHELAN (*Jour. Dairy Res. [London], 5 (1933), No. 1, pp. 42–45, figs. 3*).—These experiments at the Dairy Research Institute, New Zealand, were conducted partly with a mixed commercial culture of lactic streptococci and partly with a suspension in saline of a pure culture of the organism washed from the surface of yeast whey agar.

The results showed there was always a stimulation of acid production by the addition of 1 percent salt and frequently with 2 percent salt. In one case

there was a definite stimulation from the addition of 3 percent salt but in other cases a marked inhibition of growth. Higher concentrations of salt definitely inhibited the growth of starter culture, and total inhibition was approached by any concentration greater than 6 percent. A concentration of 5 percent salt, while inhibiting growth, was within the limits of concentration in cheese of good body. This fact suggested that the effect of salt on cheese body may be due in part to its retarding effect on the growth of lactic streptococci. The inhibiting effect of a 5 percent salt solution was the same at both 37° C. and 30°.

The numbers of lipolytic bacteria in various dairy products, as determined with nile-blue sulfate, B. W. Hammer and M. A. Collins (*Iowa Sta. Res. Bul. 169 (1934), pp. 73-92*).—This study was concerned with the numbers of lipolytic bacteria in various dairy products, as determined with nile-blue sulfate. In the studies on butter, particular attention was given to the relationships of the organisms to rancidity.

These organisms were common in the raw fresh milk and in the raw sweet cream examined. The higher total bacterial counts on cream than on milk were accompanied in general by the larger numbers of lipolytic bacteria. Rancidity commonly developed in butter churned from raw cream and held at 6° C., and such butter had rather large numbers of lipolytic organisms. On continued holding there was usually a pronounced decrease in the total and lipolytic bacteria in the butter. These organisms were comparatively scarce in fresh butter made from pasteurized cream. Butter made from pasteurized cream in a carelessly treated churn often became rancid when stored for long periods at 0° C. In some cases such butter contained large numbers of lipolytic bacteria. In old commercial butter showing various defects the numbers of total and lipolytic bacteria varied widely, but the highest counts of the latter organisms were found in butter that was cheesy rather than rancid. The numbers of total bacteria in butter when rancidity first developed varied widely. Usually the numbers were smaller in butter made from sterilized cream to which a culture of lipolytic organisms had been added than in butter made from raw sweet cream.

Certain of these organisms commonly grew more rapidly at the surface of butter, but in other instances the larger numbers were found in the deeper layers. Some organisms which showed slight lipolytic power had little influence on the flavor of butter. In butter made from sterile cream inoculated with a pure culture of lipolytic organisms, there was a decrease in the numbers of organisms following the increase that was presumably responsible for developed rancidity. The organisms studied showed greater variation in their salt tolerance. Milk from individual cows that became rancid when held at low temperatures frequently contained large numbers of lipolytic bacteria, indicating that these organisms must be considered as a possible factor in this condition under certain circumstances.

The vitamin A content of skimmilk, standardized milk, and cream from different breeds of cows, I. L. Hathaway and H. P. Davis (*Nebraska Sta. Res. Bul. 69 (1933), pp. 16*).—Continuing the experiments on the vitamin A content of the milk of cows of different breeds (E.S.R., 65, p. 262), a study was made of the vitamin A content of skim milk, of milk standardized by the addition of separated milk, and of cream. Approximately 750 rats whose body stores of vitamin A had been depleted were fed one or the other of these forms of milk as a source of vitamin A.

It was found that the vitamin A content of milk was largely associated with the butterfat. Separated milk containing only small amounts of fat con-

tained only small amounts of vitamin A. Standardizing milk by the addition of separated milk reduced its vitamin A potency. Under the conditions of this investigation there was more vitamin A in Holstein cream than in Jersey cream.

The vitamin A content of Holstein and Jersey cream, I. L. HATHAWAY and H. P. DAVIS (*Holstein-Friesian World, 30 (1933), No. 22, pp. 7, 19*).—The results of two experiments at the Nebraska Experiment Station indicated that when Holstein and Jersey cows were maintained under similar feeding conditions, if the butterfat content of the milk produced varied widely the vitamin A content of the cream separated from this milk also varied. It appeared likely that as the fat percentages of the milks approached each other the difference in the vitamin A content of the cream separated from them would disappear.

Fat-soluble vitamins.—XXXVI, The carotene and vitamin A content of butter, C. A. BAUMANN and H. STEENBOCK (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 547–560, figs. 3*).—Continuing this series of studies (E.S.R., 66, p. 491), an investigation was undertaken of the relative carotene and viamin A content of butter as determined by spectrographic methods. The analyses were made on 14 samples collected in successive months during 1932–33.

The results showed that the vitamin A activity of butter could be accounted for on the basis of its content of carotene plus vitamin A. Carotene accounted for only 15 percent of the total biological activity of the butter. The amount of carotene ranged from 2γ per gram for April butter to 8.6γ per gram for July butter. The amount of vitamin A ranged from 9γ per gram for April butter to 20γ per gram for June butter. The variations were seasonal and regular.

There was no loss of either of these active components in butter stored for 6 mo. at 0° F., or in consequence of ultraviolet irradiation of the milk from which the butter was made. Adding carotene to winter butter in order to increase the vitamin A activity up to that of summer butter did not seem desirable unless the public would accept a more highly colored product than is now marketed.

A new way to produce soft curd milk, J. F. LYMAN, E. H. BROWNE, and H. E. OTTING (*Milk Dealer, 23 (1934), No. 4, pp. 32, 33*).—The authors describe a new and patented method of producing soft-curd milk by removing at least 20 percent of the calcium in the milk through treatment with base exchange silicates. This method does not cause appreciable changes in the appearance or flavor of the milk.

This treatment reduces the calcium and phosphorus content of the milk. The sodium and potassium content may be kept in nearly any desired ratio by selecting the proper mixture of alkali metal chlorides for reviving the zeolite. The treated milk was not coagulated by rennin when 20 percent or more of the initial calcium was removed.

Soft curd milk and mastitis, R. C. WELCH and F. J. DOAN (*Milk Plant Mo., 22 (1933), No. 11, pp. 30–32, 35, 36, figs. 2*).—The curd tension of the milk from eight herds, containing 251 cows of different breeds, the cell count, chloride content, pH value, and bromothymol blue reaction were determined at the Pennsylvania Experiment Station.

It was shown that a low curd tension in a sample of milk as determined by the Hill test was not evidence that the milk came from a diseased udder or an udder showing subclinical indications of disease. Milk from perfectly sound udders varied in curd tension from a few grams to the highest value, depending upon the characteristics of the animals secreting the milk. Udder

infections did cause a lowering of curd tension as compared with the normal value for the milk from the same udder uninfected. There was an imperfect correlation between the curd tension and casein content of normal milk. The same was true of milk from infected udders, but the correlation was still less marked. The chief reason for lower curd tension in samples from infected udders appeared to be due to the lower casein content of such milk.

Bacteriological analysis of powdered milk, P. S. Prickett and N. J. Miller (*Milk Plant Mo., 22 (1933), No. 8, pp. 24–29, 33, figs. 4*).—In this study the authors found that a fairly satisfactory picture of a milk powder's sanitary quality and history could be obtained by (1) "standard plate count" per gram, (2) a similar count with plates incubated at 55° C., (3) microscopic count of bacteria, (4) mold count, and (5) sediment test.

The application of the standard methods of milk analyses to dried milk required modifications, some of which are suggested, of the corresponding method used for fluid milk.

Methods of standardizing ice cream mixes, W. C. Cole (*California Sta. Circ. 333 (1934), pp. 35, figs. 2*).—In this publication the author describes the available methods for standardizing and restandardizing ice cream mixes. The advantages of each method and its limitations are discussed.

The effect of egg products on the whipping properties of ice-cream mixes made from butter and dried skim milk, C. C. Walts and C. D. Dahle (*Jour. Agr. Res. [U.S.] 47 (1933), No. 12, pp. 967–977*).—Studies at the Pennsylvania Experiment Station were planned to determine the effect produced by the addition of various egg products to ice cream mixes made with unsalted butter, dried skim milk, and water. The basic mixes had the same composition, were processed in the same manner, and the finished products were scored by three judges after hardening from 3 to 5 days at −10° F.

Adding 0.5 percent of dried egg yolk to the mixes greatly improved their whipping qualities. This improvement was more noticeable in mixes made with butter and dried skim milk than in mixes made with cream and dried skim milk. There was no difference in the improvement produced either by Chinese or domestic dried egg yolk. While both dried whole egg and sweetened frozen egg yolk improved the whipping qualities, neither gave as good results as dried egg yolk.

Of the various fractions separated from dried egg yolk, the vitellin was detrimental to the whipping properties. Egg yolk salts, singly and combined with egg yolk proteins, had a slightly beneficial effect. The most pronounced beneficial effect, however, was obtained with the portion of the yolk containing lecithin. Adding from 0.01 to 0.2 percent of egg lecithin to the basic mixes gave decidedly beneficial results, but soybean lecithin was detrimental to whipping properties. The addition of sweet cream buttermilk to the basic mix improved the whipping properties.

It was thought that a lecithin-protein complex in the yolk was responsible for the improved whipping properties, and that a similar complex was present in buttermilk. The data indicated that the presence of this complex in cream mixes made them whip more readily than butter mixes. It is recommended that when the basic mix used in this study is used commercially 0.5 percent of good quality dried egg yolk be added to improve the whipping properties.

Vitamin C in frozen strawberries and in strawberry ice cream, C. R. Fellers and M. J. Mack (*Ice Cream Trade Jour., 29 (1933), No. 8, pp. 27, 28, figs. 2*).—The data reported have been essentially noted (E.S.R., 70, p. 282).

VETERINARY MEDICINE

The practice of veterinary medicine, D. H. Udall (*Ithaca, N.Y.: Author, 1933, pp. 267+[7], figs. 81*).—In this work the author presents concise and systematic descriptions of the various internal diseases of herbivorous animals and swine.

Veterinary surgical operations, H. E. Bemis (*Teutopolis, Ill.: Worman Ptg. Inc., 1933, pp. 348, figs. [92]*).—This posthumous work deals with the subject in four parts as follows: (1) Surgical methods (pp. 13–40), and (2) surgical diseases of the head (pp. 41–164), (3) of the trunk (pp. 165–282), and (4) of the extremities (pp. 283–340). An introduction by C. H. Stange (p. 3) and a list of papers published by the author (pp. 341–343) are included.

[Work with animal diseases at the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 192 (1933), pp. 6–10, 11, 12*).—This work includes infectious abortion, infectious mastitis, coccidiosis of chickens, mycosis in poultry, sheep diseases, and a record of animal diseases diagnosed.

[Report of work with diseases of livestock at the Michigan Station], E. T. Hallman, W. Giltner, et al. (*Michigan Sta. Rpt. 1932 pp. 171–181, 183–199, 204, figs. 2*).—The work of the year referred to (E.S.R., 68, p. 375) includes that with infectious abortion, by C. F. Clark, and its control, by B. J. Killham; parasitism of sheep, by L. B. Sholl; nonvirulent live virus vaccination of cattle against infectious abortion, by D. B. Meyer; other immunological studies of the disease, work with *Brucella* culture collection, *Brucella* infection in swine, chemistry of *Brucella*, diagnostic studies of infectious abortion, and undulant fever of man, all by I. F. Huddleson; and vaccination with pigeon pox virus, blackhead in turkeys, avian tuberculosis, lead poisoning in ducks, and preparation of hemolysins and precipitin, all by H. J. Stafseth.

Report of the veterinary service for the years 1931 and 1932, J. M. Smith et al. (*Palestine Dept. Agr. and Forests Rpt., 1931–32, pp. 97–163*).—In this report of the occurrence of and control work with diseases of livestock in Palestine (E.S.R., 67, p. 313) particular attention is given to the work with infectious diseases. A plan for the eradication of infectious abortion in cattle from infected herds is considered at length in an annexure (pp. 111–114), as is a report from the veterinary laboratory by S. J. Gilbert (pp. 126–130).

Annual report of the Imperial Institute of Veterinary Research, Muktesar, for the year ending 31st March 1932, F. Ware et al. (*Imp. Inst. Vet. Res., Muktesar [India], Ann. Rpt., 1931–32, pp. II+55*).—Included in this report (E.S.R., 68, p. 376) are accounts of the sections of pathology, by S. C. A. Datta (pp. 14–21); serology, by J. R. Haddow (pp. 22–28); and protozoology, by S. K. Sen (pp. 29–37); and of the Imperial Veterinary Serum Institute, Izatnagar, by J. D'Costa (pp. 38–42).

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 12 (1933), Nos. 1, pp. 1–41, pls. 3; 2, pp. 47–92, pls. 4; 3, pp. 113–223, pls. 10, figs. 9; 4, pp. 231–310, pls. 6, figs. 2*).—The contributions presented (E.S.R., 69, p. 421) in No. 1 are as follows: Contribution to the Patho-anatomical Knowledge of Farinas' Avian Pest [E.S.R., 66, p. 576], Particularly a Comparison with the Korean Fowl Plague, by T. Fukushima and K. Shimomura (pp. 1–7, Japan. abs. p. 7); Bacteria of the Paratyphoid Group Cultivated from Guinea Pigs, by T. Konno and N. Imai (pp. 8–16, Ger. abs. p. 16); The Agglutinative Relation of *Bac[terium] abortus equi* to the Schottmüller and Mäuse Typhus Bacilli as Shown by Antigen Analysis, by T. Konno and K. Hashimoto (pp. 17–28, Ger. abs. p. 28); and On a New Species of the Genus *Eustrongylides* [*E. formosensis*] from Formosan Heron [*Bubulcus ibis coromandus*], by M. Sugimoto (pp. 29–41, Eng. abs. pp. 39–41).

The contributions in No. 2 include the following: Studies on Hemorrhagic Septicemia Organisms, Especially on Their Variability—Report IV, Studies on Hemorrhagic Septicemia Organisms Isolated from Sheep, by Y. Ochi (pp. 47–52, Eng. abs. pp. 51, 52) (E.S.R., 67, p. 451); The Precipitating Capacity of the Sera of Pullorum Infected Hens as Related to Agglutination, by T. Konno and Y. Goto (pp. 53–60, Ger. abs. pp. 57–59); Studies on the Life-History of *Echinorhynchus gigas* in Manchuria, I, by S. Ono (pp. 61–68, Eng. abs. pp. 67, 68); and Studies on the Pus of Horses, by E. Tatezawa (pp. 69–92, Eng. abs. pp. 90–92).

The contributions in No. 3 include the following: Studies on the Purification of Mallein, II, by M. Umezu (pp. 113–128, Eng. abs. pp. 127, 128) (E.S.R., 68, p. 244); Complement-Fixation Experiments with the Sera of Pullorum-Infected Fowls as Related to Precipitation, by T. Konno and K. Zaizen (pp. 129–134, Japan. abs. pp. 133, 134); Comparative Immunological Investigations of the Korean Fowl Plague Virus and the Japanese Fowl Pest Virus—Their Relation to the Virus of Newcastle Disease, by J. Nakamura, S. Oyama, K. Fukusho, and N. Tomonaga (pp. 135–146, Japan. abs. pp. 145, 146); The Pathology of Fowl Pest, including a Review of the Korean Fowl Plague, by T. Fukushima (pp. 147–164, Japan. abs. p. 164); Studies on the Life History of Spiruridae in Manchuria—I, The Morphologic Studies on the Encysted Larvae Found in Two Species of Dung Beetle, Dragonfly, Hedgehog, Domestic Fowl, and Duck, as well as Their Infestation Experiments with Rabbits and Dogs, by S. Ono (pp. 165–184, Eng. abs. pp. 182–184); Studies on Hemorrhagic Septicemia Organisms—Report V, Correlations between Hemorrhagic Septicemia Organisms Isolated from Various Animals, by Y. Ochi (pp. 185–199, Eng. abs. pp. 198, 199) (see above); and A Study of Reproduction in the Mare—II, The Study on the Oestrus, by S. Satoh and S. Hoshi (pp. 200–223, Japan. abs. pp. 221–223) (E.S.R., 68, p. 812).

The contributions in No. 4 include the following: On a Trematode Parasite, *Echinostoma cinetorchis* Ando & Ozaki 1923, from a Formosan Dog, by M. Sugimoto (pp. 231–237, Eng. abs. p. 237); Tuberculosis Antibodies and Specific Therapy [trans. title], by G. Finzi (pp. 238–250); On a Nematode, *Haemonchus similis* Trav. 1914, from Korean Calves, by O. Isshiki (pp. 251–263, Eng. abs. pp. 262, 263); Studies on *Corynebacterium renalis* (*Bacillus renalis bovis* Bollinger), I, by K. Hirato (pp. 264–289, Eng. abs. p. 289); Precipitation and Complement Fixation with Anthrax Sera and the Relation of the Two Reactions, by T. Konno and T. Tanikawa (pp. 290–299, Japan. abs. pp. 298, 299); and Observations on the Change in the Blood Elements of the Horse Infected with Strangles, by S. Ishii and S. Watanabe (pp. 300–310, Eng. abs. pp. 309, 310).

[The introduction of diseases of livestock and their eradication or control in Australia], W. A. N. ROBERTSON (*Aust. and New Zeal. Assoc. Adv. Sci. Rpt., 21 (1932), pp. 306–319*).—This contribution forms part of the presidential address of the section of veterinary science presented at the twenty-first meeting of the Australian and New Zealand Association for the Advancement of Science. The introduced infections referred to include sheep scab, first referred to in 1788 as present, becoming widespread, and finally eradicated in Australia by 1895; foot-and-mouth disease, first referred to in 1801 and eradicated; malignant catarrh of sheep, first reported in 1834; anthrax, reported in 1847; rabies in 1867 and eradicated; contagious pleuropneumonia, reported in 1858 and eradicated; glanders, in 1891 and eradicated; hog cholera, reported in 1903 and eradicated by 1929; surra, reported in 1907 and eradicated; rinderpest, in 1923 and eradicated; and fowl plague, in 1930 and eradicated. Men-

tion is also made of the appearance of the buffalo fly in the Northern Territory, thought to have been introduced with cattle from Timor in 1824 and of the cattle tick, apparently introduced from Batavia in 1872 into Darwin, from which it slowly spread into the east and west. A historical account of the development of disease control in the Commonwealth follows.

Water-ways as vehicles of infectious diseases, affecting particularly cattle in Egypt, and the relative sanitary precautions, M. CARPANO, trans. by E. TALAREWITCH (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 134 (1933), pp. 8*).—A discussion of the subject as applied to Egypt.

Pathogenesis of brucellosis Bang, J. VAN DER HOEDEN (*Jour. Compar. Path. and Ther., 46 (1933), No. 4, pp. 232–247*).—Experiments are here reported in which the bovine type of *Brucella abortus* was tested on dogs, guinea pigs, a horse, and a goat. The details of the experiments are presented in tabular form.

Additional studies on the relationship of the viruses of Rocky Mountain spotted fever and Sao Paulo exanthematic typhus, G. E. DAVIS and R. R. PARKER (*Pub. Health Rpts. [U.S.], 48 (1933) No. 33, pp. 1006–1010, figs. 3*).—The authors find (E.S.R., 70, p. 69) that guinea pigs which have received Rocky Mountain spotted fever vaccine are protected in equal degree against the spotted fever and São Paulo viruses. Guinea pigs which have recovered from the São Paulo disease are completely resistant to spotted fever virus. Monkeys which have recovered from spotted fever are completely resistant to São Paulo virus. These results are additional evidence of the essential identity of the two viruses.

A note on the species of the genus Haemonchus Cobb, 1898 (Nematoda, Trichostrongylidae) [trans. title], J. LINS DE ALMEIDA (*Compt. Rend. Soc. Biol. [Paris], 114 (1933), No. 35, pp. 960, 961, fig. 1*).—The author finds *H. fuhrmanni*, *H. pseudocontortus*, and *H. atectus* to be synonyms of *H. contortus*, the common stomach worm.

A comparison of Koch's old tuberculin with a new synthetic-medium tuberculin, M. DORSET (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 439–449, figs. 3*).—The author concludes from the data thus far obtained that the special tuberculin from the synthetic medium is not only a very pure product from a chemical standpoint but also one which, judged on the basis of practical field results, is more potent and reliable than the old glycerinated broth tuberculin. This contribution is followed (pp. 449–456) by an extended discussion of the subject by E. A. Watson, H. M. O'Rear, and W. A. Hagan.

Tuberculous infection in milk: A report by the Department of Health for Scotland (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 189 (1933), pp. 38*).—Investigations of the milk supply of Aberdeen, Dundee, Edinburgh, and Glasgow, are summarized as follows:

"The extent of infection of samples of raw milk in churns, ascertained by the technic outlined, is in the aggregate of the four principal Scottish cities 10 percent. As would be anticipated, the degree of infection increases with the amount of bulking to which the milk is subjected; and in a series of over 200 samples of creamery bulked milks, wherein the average volume of milk from which the samples were taken reaches 500 gal., more than one third of the samples were found infected with tubercle bacilli.

"A marked reduction of infection results from heat treatment. The superiority of the holding over the flash methods has been elicited, and the relative efficiency of different plants examined. It is estimated that the general rate of infection of milk retailed in the four cities is a little above 5 percent. The examination of a large number of samples of certified and grade A (T.T.)

milks has shown the safety of these in respect of tuberculous infection. The necessity for a standard method of examination if comparisons between different areas are to be made has been clearly demonstrated."

Survey to determine the incidence of Bang's disease in Minnesota cattle, C. P. Fitch and C. R. Donham (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1203–1205*).—In this contribution from the Minnesota Experiment Station, working in cooperation with the U.S.D.A. Bureau of Animal Industry, the authors record the results of tests of 3,183 animals from two areas in that State. Of the animals tested 88.3 percent reacted negatively, 5.9 were suspicious, and 5.8 were positive. There were 181 herds of cattle, with an average of 17.6 animals per herd. Of these herds, 66.3 percent were entirely negative, 12.7 had 1 or more suspicious animals but no positive animals, and 21.0 had 1 or more positive animals. Only 1 herd showed 100 percent of suspicious and positive animals. There were 13 animals in this herd, all more than 3 mo. of age.

Presence of Bact[erium] abortus Bang in raw milk, butter, and ice cream, C. P. Fitch and L. M. Bishop (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1205–1207*).—This is a preliminary report, contributed from the Minnesota Experiment Station, of a study made of the raw milk of two municipalities. *B. abortus* was not isolated from nor agglutinins demonstrated in 18 samples of milk from one of these municipalities which required all such milk to come from cattle negative to the agglutination test for infectious abortion, but the organism was isolated from 6 of 12 samples of milk from the other city, which had no such requirement, and agglutinins for *B. abortus* were demonstrated in the milk from 2 of 6 dairies in the 1:50 dilution.

Three experiments were conducted with butter made from unpasteurized cream collected by gravity separation from milk of cows known to be shedding *B. abortus*. Guinea pigs were inoculated shortly after manufacture, and *B. abortus* was isolated from the buttermilk and the salted and the unsalted butter.

Two experiments have been completed in which *B. abortus* was recovered from ice cream prepared from cream known to be naturally infected.

The handling of Bang's disease in the field, with records of reproduction of clean cattle, recent reactors, and chronic reactors covering 5,074 cow-years, R. R. Birch, C. H. Milks, and H. L. Gilman (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 341–362*).—The authors report upon the results of control work with infectious abortion in 50 herds, containing 3,510 animals more than 10 mo. old, that were under supervision at the end of the period covered by the records here reported. The details are given in tabular form.

Of the herds under supervision, 12 were badly infected when first tested and have been freed entirely from Bang's disease. Of these 12 herds, 6 have been cleaned with the partial segregation plan and 2 with the complete segregation plan, in 3 the reactors were sold, and in 1 partial segregation was followed by sale of reactors.

The status of vaccination against Bang's disease, W. E. Cotton and J. M. Buck (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 329–340*).—This contribution is presented in connection with a list of 15 references to the literature.

Studies on bovine mastitis.—IX, A selective medium for the diagnosis of Streptococcus mastitis, S. J. Edwards (*Jour. Compar. Path. and Ther., 46 (1933), No. 4, pp. 211–217, figs. 2*).—In this further work (E.S.R., 70, p. 531) a selective medium has been devised by the author which has given satisfactory results in the cultural diagnosis of bovine mastitis. In its preparation, ad-

vantage has been taken of the fact that streptococci are more resistant to the bactericidal action of crystal violet than the majority of milk saprophytes. The organisms which are not inhibited by the dye can be differentiated in blood agar from mastitis streptococci by the inclusion of esculin, upon which they act to produce black colonies.

Trembles (or milk sickness), J. F. COUCH (*U.S. Dept. Agr. Circ. 306 (1933), pp. 12, figs. 7*).—This contribution, which supersedes Farmers' Bulletin 1593 (E.S.R., 62, p. 75), summarizes the present status of knowledge of this affection of man and animals in connection with a list of 26 references to the literature.

The occurrence of Babesia motasi Wenyon, 1926, to sheep in Northern Nigeria, with a discussion on the classification of the piroplasms, J. G. THOMSON and G. N. HALL (*Jour. Compar. Path. and Ther., 46 (1933), No. 4, pp. 218–231, figs. 6*).—The classification of the piroplasmata is here dealt with at some length. A list of 56 references to the literature is included.

Anaplasmosis-like disease in swine, A. T. KINSLEY and J. D. RAY (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 391, 392.*)—This contribution reports upon an anaplasmosis-like disease found in herds of swine in Illinois during the spring and summer of 1932. This malady has occurred in swine in Illinois, Iowa, South Dakota, and Missouri, and is apparently quite prevalent in the territory adjacent to Sioux City, Iowa. It is pointed out that the disease described by Doyle (E.S.R., 68, p. 531) is apparently identical with that described by the authors.

Brucella infection in swine, F. M. HAYES (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 322–329*).—In this contribution the author reviews briefly the results of investigations of *B. abortus suis* infection upon which there is general agreement.

The diagnosis of porcine brucelliasis by the intradermal test [trans. title], P. ROSSI (*Compt. Rend. Soc. Biol. [Paris], 114 (1933), No. 35, pp. 875–878*).—The author finds that the intradermal test is applicable to the diagnosis of brucelliasis of swine under the same conditions that it is applicable to diagnosis of the disease in other animals.

The occurrence of Isospora suis n.sp. in swine.—A preliminary report, H. E. BIESTER and C. MURRAY (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, p. 294*).—The name *I. suis* is given to an undescribed host specific form encountered in swine in Iowa. Experimental infections produced anorexia and diarrhea of the nonhemorrhagic type, followed by constipation. Surface desquamation and necrosis of the terminal portion of the substantia propria of the villi of the small intestine with a concomitant interstitial inflammatory reaction, with eosinophilic infiltration of the myelocytic type, was noted.

The persistence of hog cholera virus in the bodies of swine after simultaneous inoculation, C. N. MCBRYDE (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 420–430*).—The author has been unable to demonstrate the hog cholera virus in the circulating blood of simultaneously treated pigs 3 weeks after vaccination. It is pointed out that in earlier experiments the virus was found to be present at 2 weeks but not at 4 weeks, and that it apparently disappears from the circulating blood about the third week after vaccination. The virus may persist in the lymphatic glands of simultaneously treated pigs at 3 weeks, but in no case could it be found in these glands at the end of 6 weeks.

These results, taken in conjunction with those of other investigators, are considered to disprove the contention of Michalka that the virus persists in the lymphatic glands of simultaneously treated pigs as late as 10 mo. after vaccination, and would seem to negative his theories regarding "late reactions" and "virus carriers" in connection with simultaneous immunization.

"In two experiments to test the infectiousness of the urine of simultaneously treated pigs no virus was found at any time in one experiment, while in another experiment it was apparently present in tests made at 5, 9, 20, and 26 days, but was absent on the fifteenth day. These results may indicate that the excretion of virus in the urine of simultaneously treated pigs is a variable function; that is to say, it may or may not occur and when it does occur the virus is not thrown off with absolute regularity. In view of the entirely negative results in the first experiment, however, which was carried out under more ideal conditions than the second one, it would seem doubtful whether virus is excreted in the urine to any extent by simultaneously treated pigs. Furthermore, even though virus may be thrown off in the urine, it does not follow that susceptible pigs would necessarily pick up cholera infection from this source; this was shown in earlier experiments in which large amounts of urine from cholera-sick pigs were scattered in pens containing susceptible pigs, with negative results.

"The findings reported in the present paper and in earlier experiments which have been cited would seem to support the conclusions arrived at some years ago, which have recently been confirmed by Uhlenhuth and his coworkers, that there is little, if any, danger under practical conditions of creating virus carriers or spreaders through simultaneous immunization. This conclusion is further confirmed by the good results which have followed the widespread use of simultaneous immunization in this country.

"It is desired to emphasize the fact that the experiments reported in the present paper are of a preliminary nature and the conclusions which have been reached should not be regarded as final, for it is quite evident that further study should be given this matter."

Swine fever and paratyphoid in pigs (*Jour. Compar. Path. and Ther., 46 (1933), No. 4, pp. 257–265*).—This is an editorial in which the etiology of hog cholera and paratyphoid of pigs is considered in the light of present knowledge. It is pointed out that in nature hog cholera is usually a mixed infection of virus and bacilli. There is said to be no doubt, however, that in all cases in which swine contract the disease naturally it is at the outset a pure virus disease in the sense that the virus alone is responsible for the observed departures from the normal. Since the duration of this virus stage of the disease usually is a short one, there is little opportunity to study the pure virus disease in field cases.

Field and laboratory studies on the behavior of the larvae of the swine kidney worm, Stephanurus dentatus, L. A. SPINDLER (*U.S. Dept. Agr., Tech. Bul. 405 (1934), pp. 18*).—In a survey made near Moultrie, Ga., of hog pastures infested with *S. dentatus*, the larvae were found almost entirely on moist shaded soil protected from light and desiccation. The larvae were found concentrated beneath debris covering the feeding grounds, and less frequently among moist pine needles, on moist shaded paths, and beneath grass on low-lying pastures. On experimental plats to which adequate moisture was supplied, larvae lived on soil beneath debris for 76 days; on soil covered with growing grass they lived 67 days; on shaded areas, 66 days; on porous unshaded soil the larvae lived 37 days; in wallows they lived only 4 days; and on unshaded, bare, packed soil they lived 3 days. Under actual pasture conditions, live larvae were recovered from carpet-grass pastures for a maximum period of 24 days, and from pine needles in a pine grove for a maximum period of 29 days.

From a study of t[illegible] 1 which would indicate that infective larva[illegible] ice of soil after being covered to the usual [illegible] 1 of infective larvae on

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perimental and field conditions when the grass was wet with dew. It was found in a study of kidney worm-infested fields extending over a period of 18 mo. that growing a crop on an infested area will apparently free the fields of the larvae present.

Some poultry diseases, J. F. Craig (*Vet. Rec., 14 (1934), No. 3, pp. 53–60*).—A summary of knowledge of the five more important diseases of poultry met with in Ireland, namely, avian tuberculosis, bacillary white diarrhea or pullorum disease, fowl typhoid, fowl pox, and coccidiosis.

Hematology of the fowl, F. W. Cook and R. S. Dearstyne (*North Carolina Sta. Tech. Bul. 44 (1934), pp. 51, figs. 10*).—The first part of this contribution deals with studies of the normal avian blood (pp. 4–26) and part 2 with studies of the hematology of avian typhoid (pp. 26–42).

The studies of the normal blood deal with the cellular and hemoglobin content of the blood of 80 normal fowls. "Numerical counts of erythrocytes showed the highest percentage of instances (31.3 per cent) of the 80 studies made lying between 2,760,000 and 3,000,000 per cubic millimeter, one count running less than 2,000,000 and two showing over 4,000,000. The total white cell counts show the greatest percentage of instances (26.3 percent) having a count of from 11,000 to 15,000 per cubic millimeter, 76.3 percent of the 80 studies made having a white cell count of 20,000 or less. In the differential studies of white cells the heterophile count was found to be from 41 to 45 percent in 21.3 percent of the 80 cases studied, the eosinophiles from 1 to 3 percent in 37.5 percent of the cases; the monocytes showed from 7 to 15 percent of the total white cells, the small lymphocytes 21 to 25 percent, the intermediate lymphocytes 1 to 3 percent, and while the large lymphocytes were absent in 54 studies 25 counts revealed 1 to 3 percent of this type of white cell."

The period of incubation of avian typhoid was found to range from 14.5 to 92.5 hr. after inoculation, the prodromal period being from 56.5 to 108.2 hr. after inoculation and the fastigium from 70.75 hr. to the commencing of the period of decline. "In the period of incubation of avian typhoid the total white cell count, the heterophiles, and the monocytes made a decided numerical increase and the erythrocytes, hemoglobin, and the lymphocytes a decided decrease from the established normal. The hemoglobin content decreases in greater relative proportion than the decrease in erythrocytes. Observations on the morphology of the cellular content of the blood during this period reveals no marked change from the normal. In the prodromal period the heterophiles, small lymphocytes, and erythrocytes continue their trends observed in the period of incubation. The hemoglobin decreases relatively in the same proportion shown by the erythrocytes. The total white cell count is increased. A typical morphological picture of the cells is presented in this period. Immature monocytes predominate the picture. In the period of fastigium the blood trends noted in the prodromal period are emphasized. There is a drastic increase in total white cell count. The combined periods of decline and convalescence show a blood picture tending toward return to normal according to the rapidity with which the bird has thrown off the disease. The return to normality of the white cell count is retarded to a greater extent than that of the cellular elements."

Leukosis of the common chicken, W. H. Feldman and C. Olson, Jr. (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 488–499*).—The authors have found that a fatal blood dyscrasia in which there is commonly found profound anemia associated with leukemia frequently occurs among domestic chickens. "The leukemic state is due to excessive numbers of myeloblastic cells, among which cells of the erythroblastic and granuloblastic series may be recognized. Aside

from the blood-vascular changes the most significant lesions are hyperplasia of the bone marrow, liver, and spleen. The disease is readily transmissible to other animals of the same species, but little is known of the physical characteristics of the factor or substance capable of transmission. The disease has many features common to neoplasm, and we are inclined to believe it should be classified with this group of diseases."

The account is accompanied by a list of 10 references to the literature.

Mycosis in fowl caused by yeast-like fungi, E. Jungherr (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 500–506, figs. 4*).—Contributing from the [Connecticut] Storrs Experiment Station, the author summarizes the present knowledge of mycotic infections in fowl caused by yeastlike fungi, earlier accounts of which have been noted (E.S.R., 70, p. 536), which affect principally the mucous membranes of the upper digestive tract. "The infections occur in all domesticated birds and in game birds raised in captivity, and predominate during wet, early summer seasons. In very young birds the infections may be accompanied by heavy mortality. Immune carriers of the malady seem to be uncommon, but the organisms appear to be capable of maintaining life in a nonparasitic state. The organisms are probably widespread in nature, but it is not known under what set of conditions they assume invasive properties; they are resistant to disinfection with common coal-tar derivatives. *Monilia albicans* is the principal cause of moniliasis and *Oidium pullorum* n.sp. of oidiomycosis in fowl."

A study of the relative efficacy of pigeon pox and attenuated fowl pox vaccines, I. J. Kligler, A. Komarov, and N. Fiat (*Jour. Compar. Path. and Ther., 46 (1933), No. 4, pp. 248–256*).—It is concluded from investigations conducted at the Hebrew University, Jerusalem, that "no risk of secondary lesions is involved in the use of pigeon pox vaccine. The risk involved in the use of fowl pox vaccine is relatively small in the case of healthy birds, but may be more serious in an unhealthy flock. Pigeon pox vaccine produces mild, promptly healing lesions without secondary involvement. Attenuated fowl pox vaccine produces severe lesions of longer duration and often associated with secondary lesions in the mouth and comb. The duration as well as the degree of immunity produced by attenuated fowl pox vaccines is greater than that produced by the pigeon pox vaccine. In the latter case the immunity is less solid and approximately 10 percent of the birds remain unimmunized."

Studies on pullorum disease.—I, The influence of different temperatures in brooding, J. M. Moore, W. L. Mallmann, and L. R. Arnold (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 526–536, figs. 7*).—In this contribution from the Michigan Experiment Station, the authors report finding that chicks hatched from reactor hens and brooded at varying temperatures for the first week had a much higher mortality than chicks hatched from tested hens and brooded under similar conditions.

"In the four brooding temperatures used, viz, 96, 88, 80, and 72° F., chicks hatched from the tested stock did not show such an increase in mortality as the temperature in the compartments was lowered as did the chicks hatched from reactor stock. Chicks hatched from tested hens and brooded in the same brooder compartments with chicks hatched from reactor hens showed a higher mortality than when they were brooded by themselves under similar conditions. Chicks hatched from tested stock have a much better chance of living when they are subjected to hardship, such as improper temperature in shipping or poor management after they reach the flock owner, than have those chicks hatched from untested stock. The purchase of clean stock is recommended."

Passage of the avian, human, and bovine tubercle bacilli into the eggs of infected fowls [trans. title], E. LIVERANI (*Compt. Rend. Soc. Biol. [Paris], 115 (1934), No. 2, pp. 133, 134*).—Experiments are reported which show that the avian type of the tubercle bacillus frequently passes into the egg and reproductive organs of the spontaneously or artificially infected fowl. Virulent bacilli of the mammalian types—both human and bovine—when intravenously injected into the fowl in large doses may be detected many days later in the same organs and the eggs.

The administration of heated oöcysts of Eimeria tenella as a means of establishing resistance and immunity to cecal coccidiosis, H. A. JANKIEWICZ and R. H. SCOFIELD (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 3, pp. 507–526, fig. 1*).—The authors have found that chicks become effectively resistant and in some cases totally immune to further infection with *E. tenella*, the cause of cecal coccidiosis, through the capsule feeding of three doses of oocysts at 5-day intervals.

"Oocysts exposed to temperatures slightly below the lethal death periods exhibit atypical segmentation, resulting in formation of two, three, five, or more atypical sporoblasts, as well as the usual number of four sporoblasts. Oocysts heated at 46° C. for 15 min. yield very few such atypical forms, while oocysts heated for 10 min. at 48° yield over 10 percent such abnormal forms.

"A dose of 100 UNH. [unheated] *E. tenella* oocysts, if fed 5 to 9 days previous to a dosage of 500 *E. tenella* oocysts, prevents the slight hemorrhage which ordinarily follows initial feedings of the latter dose. This fact makes possible the use of increasingly larger successive feedings in the immunizing procedure.

"The virulence of oocysts kept at room temperature, of those heated before their segmentation, and of those heated after their sporulation differ considerably. Unheated oocysts are the most virulent. Oocysts heated before their segmentation are the least virulent, while those heated after their sporulation are intermediate in virulence. Furthermore, sporulated oocysts of these heated cultures can be fed in greater numbers than unheated cultures without the appearance of hemorrhage, other clinical symptoms, or deaths. This fact makes them desirable for use in initial inoculations.

"An initial inoculation of 649 oocysts of *E. tenella* heated after their sporulation for 15 min. at 48°, a second dose of 1,100 such oocysts, and a final dose of 3,300 such oocysts administered in capsules and fed at 5-day intervals leave chicks either resistant to heavily established later infections or totally immune parasitologically to *E. tenella*. The chicks are completely protected against death or the usual symptoms of cecal coccidiosis.

"The original feeding of 649 oocysts of *E. tenella* heated after their sporulation, followed at 5-day intervals by a second feeding of 560 unheated oocysts, and a final feeding of 1,800 UNH. oocysts, confers a resistance against cecal coccidiosis just as effective as that outlined [above]. No deaths or severe symptoms result from subsequent tests with *E. tenella* in mass dosage. A portion of the chicks develop a complete parasitological immunity, entering sporozoites being unable to reach the oocyst stage. The remaining chicks are sufficiently resistant to prevent an established heavy reinfection.

"The sole feeding of sporulated oocysts of *E. tenella* heated prior to their segmentation for 15 min. at 48° does not yield complete immunity or resistance to cecal coccidiosis, although such a feeding does lower the mortality appreciably. Clinically, however, this is far from satisfactory. An 18,000 single dosage of such oocysts initiates a moderate hemorrhage and lowers the mortality of chicks tested 34 days later from the expected 62.5 percent to 16.7 percent. A 4,000 dosage of such oocysts causes slight hemorrhage, and the

mortality of such chicks tested 34 days later was 23.1 percent. Increasing the number of H.B.S. [heated before sporulation] dosages to three, giving a first feeding of 658 such oocysts, a second feeding of 1,170 such oocysts, and a final feeding of 3,200 such oocysts at 5-day intervals did not improve the subsequent immunity. Twenty-four percent of chicks so inoculated died with acute cecal coccidiosis when tested, and symptoms of infections were present in many of the survivors.

"Most of the chicks died during the fifth day after testing. None died before the fourth day or after the eighth day of the test. A great majority of these experiment chicks died while the coccidia were still in the large schizont stage and hence do not pass oocysts prior to their death."

A list of 15 references to the literature is included.

Some intestinal parasites in the duck from Japan, S. Iwata and O. Tamura (*Annot. Zool. Japon., 14 (1933), No. 1, pp. 1–6, figs. 2*).—In an examination of the intestines of ducks 50 percent were found to harbor parasites. They have been found to represent 11 species, of which 1, a cestode, is described as new to science under the name *Raillietina osakensis*. A list is given of 16 references to the literature.

AGRICULTURAL ENGINEERING

[Rural water supply investigations at the Michigan Station], W. L. Mallman (*Michigan Sta. Rpt. 1932, pp. 202, 203*).—Progress results are briefly reported on the examination of wells and other sources of water and tests of the chlorine treatment of water.

Our experience with canvas hose irrigation in the orchard, C. E. Dutton (*Ohio State Hort. Soc. Proc., 66 (1933), pp. 70–73*).—An account is given of practical experiments made in a commercial orchard with canvas hose irrigation.

Terracing to prevent erosion, E. R. Gross (*N.J. Agr., 16 (1934), No. 1, p. 6*).—A brief description of the practice of terracing is given.

Public Roads, [February 1934] (*U.S. Dept. Agr., Public Roads, 14 (1934), No. 12, pp. 223–246+[2], figs. 20*).—This number of this periodical contains the current status of U.S. Public Works road construction as of January 31, 1934, and the following articles: A Time Study of Traffic Flow on the New Jersey High-Level Viaduct, by L. S. Tuttle (pp. 223–232); The Effect of Control Methods on Traffic Flow, by E. H. Holmes (pp. 233–242); and An Improved Method of Measuring Speed of Traffic, by E. H. Holmes and L. S. Tuttle (pp. 242, 243).

Some experiments on the resistance to wear of nitrogen-hardened cast iron, J. E. Hurst (*Engineering [London], 137 (1934), No. 3548, pp. 50, 51, fig. 1*).—Laboratory and field experiments on the resistance to wear of nitrogen-hardened cast iron are reported which were arranged to study the behavior of these materials under wear conditions such as exist in internal-combustion-engine cylinders.

All the tests were carried out on the material in the form of cylinder liners of the type known as dry liners. The procedure followed in an individual test consisted of fitting up the four bores of the engine with liners. In one bore a liner of one of the standard materials was fitted, and in the remaining three bores were fitted liners of the materials to be tested. The engine was then run under steady, approximately full-load conditions for a given number of revolutions. Each unit test consisted of a period of 40×10^6 engine revolutions.

Four standard types of material were used in the experiments as a basis of comparison with the nitrogen-hardened cast irons employed. These comprised

(1) plain, unalloyed centrifugal cast iron, (2) chromium-alloy cast iron, centrifugally cast, in the as-cast condition, (3) chromium-alloy cast iron, centrifugally cast, in the hardened and tempered condition, and (4) nickel-chromium-alloy cast iron, centrifugally cast, hardened, and tempered to a Brinell hardness of from 450 to 500.

On the basis of 30,000 miles of operation, the results were 27,000 miles per 0.001 in. of wear for the nitrogen-hardened cast iron and 12,125 miles per 0.001 in. for the chromium-alloy cast iron. The chromium-alloy centrifugal cast iron gave results very little different from those of the unalloyed centrifugally cast material.

In two road tests the resistance to wear of nitrogen-hardened cast iron was compared with those of chromium-alloy and nickel-chromium-alloy cast irons in the hardened and tempered condition. The tests were made in 6-cylinder engines using three nitrogen-hardened cylinder liners in each cast.

The results show that the differences between the wear values of ordinary cast iron, alloy cast irons, and hardened and tempered cast irons of the types experimented with are not of a very large order. They demonstrate clearly the improved resistance to wear under internal-combustion-engine cylinder conditions of cast iron surface-hardened by the nitrogen-hardening process. They also may be used to demonstrate the stability of the nitrogen-hardened surface under these same conditions.

Adobe or sun-dried brick for farm buildings, T. A. H. Miller (*U.S. Dept. Agr., Farmers' Bul. 1720 (1934), pp. [2]+18, figs. 22*).—This describes the method of making and using adobe in the form of sun-dried bricks. The material consists of a mixture of clayey loam, straw, and water, and is said to be of proven value as a material for walls.

Tests on brick masonry beams, M. O. Withey (*Amer. Soc. Testing Materials Proc., 33 (1933), pt. 2, pp. 651–665, figs. 5*).—In a contribution from the University of Wisconsin, data are reported on the shear and bending strengths of twenty-five 8 by 12 in. reinforced brick beams tested under third-point loading over an 8-ft. span. Three widely different varieties of brick and several variations in percentage of longitudinal steel between 0.5 and 2.3 percent, as well as different percentages of stirrup reinforcement, were used.

The tests indicate that a high degree of flexural strength and shear strength can be developed in reinforced brick beams, provided due attention is paid to mortar bond, coursing, amount and arrangement of reinforcement, and filling of joints. Formulas for reinforced concrete design with appropriate constants can be used to calculate stresses and deflections of reinforced brick beams.

Earthquake resistance of timber floors, N. B. Green and A. C. Horner (*Engin. News-Rec., 112 (1934), No. 5, pp. 142–145, figs. 4*).—Tests are reported on the range of earthquake resistance of various combinations of wood floors or roofs and their connections to brick, tile, or concrete walls. The tests included (1) lateral tests of full-size floor panels with varying arrangement of flooring and subflooring; (2) lateral tests of one-quarter-scale model floor panels, first duplicating the full-size tests, and second introducing other variables such as ratio of span to length, size and arrangement of joists with respect to direction of applied load, size and number of nails, size and arrangement of flooring and subflooring, and effect of lapping joists; and (3) tension and shear tests of bolt anchors in brick and tile walls, varying the type, size, and arrangement of anchors, as well as the thickness and mortar mix of both the brick and the tile walls. Only the full-size tests are reported on.

In these tests the expected weakness of single longitudinal flooring was demonstrated, as well as the stiffening influence of longitudinal flooring in resisting

direct bending stresses. Also a single diagonal sheathing indicated a surprising efficiency in resisting shear forces.

A wood floor panel loaded laterally appeared to deflect in a manner analogous but not exactly similar to a solid wooden beam. This indicates the importance of board length in a floor as well as the importance of adequate nailing in securing stiffness.

A discussion is given of the practical application of the test data.

The preservative treatment of estate and farm timber, R. C. B. Gardner (*Brit. Wood Preserv. Assoc. Circ. 1* (*1933*), *pp. 36, figs. 7*).—Technical and popular information is given on the preservative treatment of timbers.

Preservative treatment of posts (*Connecticut* [*New Haven*] *Sta. Bul. 357* (*1934*), *p. 128*).—Studies of the brush, pressure, and open tank treatments with creosote are briefly noted.

Large retaining-wall tests, I–III, K. Terzaghi (*Engin. News-Rec., 112* (*1934*), *No. 5, pp. 136–140, figs. 7; 8, pp. 259–262, figs. 4; 10, pp. 316–318, figs. 4*).—Tests conducted at the Massachusetts Institute of Technology are reported. The results furnish data covering the effect on earth pressure of wall movement through the entire range up to a yield sufficient to produce slip.

I. *Pressure of dry sand.*—These tests, confined to dry sand, were made to determine how any yielding of the retaining wall affects the direction and intensity of sand pressure.

The data show that there is almost no difference between the hydrostatic pressure ratio k curves for a wall which yields by tilting and a wall which yields parallel to its original position, provided both walls are backed with compacted sand. On the other hand, there is no resemblance between the k curve for a tilting wall backfilled with compacted sand and a tilting wall backfilled with loose sand.

The results showed that a striking difference exists between the behavior of dense and of loose backfill. For compacted backfill the hydrostatic pressure ratio k corresponding to the pressure acting on the wall in its original position may have any value between 0.35 and 0.7, depending on how the fill was made. Inward movement of the wall through a distance of about 0.001 h (one thousandth of the depth of the backfill) increases k up to values of 2.0 to 2.5, while outward movement of the same amount leads to the smallest values k can assume (about 0.1). Any further outward movement again causes an increase of the lateral pressure.

For compacted backfill the angle of internal friction assumes a well-defined maximum after the wall has yielded through an average distance of about 0.0007 h. If the wall yields further, the angle of internal friction increases again and approaches the maximum value for the loose backfill.

The coefficient of wall friction with dense backfill is extremely variable. If the wall moves inward toward the fill, the wall friction remains negligible. During outward movement the wall friction first assumes a maximum, then it gradually decreases toward the value that corresponds to the coefficient of wall friction for loose backfill.

For loose backfill, prior to any movement of the wall, the hydrostatic pressure ratio is about 0.4. Movement of the wall inward toward the fill through a distance of 0.001 h raises the value of k up to less than unity. On the other hand, outward movement decreases the lateral pressure until, after a movement through a distance of more than 0.008 h, slip occurs. At this point the hydrostatic pressure ratio assumes the Coulomb value approximately corresponding to the angle of repose. For the entire range of the movement, the coefficient of wall friction remains practically constant.

For both dense and loose backfill an intermission in the process of outward movement of the wall causes a slight decrease in wall friction and increase in the value k, and in most cases a slight upward movement of the point of application of the resultant pressure.

II. *Pressure of saturated sand.*—Studies are reported dealing with the results of investigations of cohesionless sand in a state of complete submergence.

It was found that the lateral pressure exerted by the submerged backfill is equal to the sum of the full water pressure and the lateral pressure of the solid fraction of the fill whose effective weight is reduced by buoyancy. The presence of the water has practically no effect on the coefficients of internal friction and wall friction. For a position of the wall in the immediate vicinity of the original one, the drainage of the fill produced a slight decrease of the hydrostatic pressure ratio k and an increase of the coefficient of wall friction tan δ. During a subsequent intermission, k increased and tan δ became smaller.

In contrast to this, after the wall moved beyond an average distance of $\frac{1}{1000}$ the depth of the backfill, drainage produced an important increase of k and a decrease of the wall friction tan δ. During the subsequent intermission k became smaller and tan δ greater.

Submergence causes a minute expansion, and drainage a more important subsidence of the fill. If the wall is close to its original position, the subsidence due to drainage is smaller than it is for more advanced positions of the wall.

The tests furnished indirect evidence for assuming that prior to slip the lower part of the back of the wall experiences lower pressure than the middle part, provided the wall is backfilled with compacted material.

III. *Action of water pressure on fine-grained soils.*—The results show that, as with submerged sand, the retaining wall backfilled with fine-grained soil such as till or clay receives full water pressure plus the pressure of the solid fraction of the fill.

Retaining wall design (*Pub. Works, 64 (1933), No. 11, pp. 21, 22, figs. 2*).—In a second contribution to the subject a brief technical analysis is given of the design of reinforced concrete walls (E.S.R., 70, p. 398).

Researches on the internal-combustion engine, C. F. TAYLOR (*Mech. Engin. [New York], 55 (1933), No. 11, pp. 689–691, figs. 5*).—The equipment and projects of the internal-combustion-engine laboratory at the Massachusetts Institute of Technology are described.

A new instrument devised for the study of combustion, C. F. TAYLOR, C. S. DRAPER, E. S. TAYLOR, and G. L. WILLIAMS (*S.A.E. [Soc. Automotive Engin.] Jour., 34 (1934), No. 2, pp. 59–62, figs. 8*).—In a contribution from the Massachusetts Institute of Technology a new instrument for studying combustion and detonation in internal-combustion engines is described.

Essentially, the instrument consists of a small diaphragm exposed to cylinder pressure. Motion of this diaphragm is imparted to a coil of wire which moves axially in a radial magnetic field. The electromotive force generated by the coil motion may be amplified and analyzed by means of an oscillograph, or the energy output may be integrated by means of a suitable instrument.

The element consists of a very light coil of wire wound on a magnesium spider which is supported in a magnetic field by the steel diaphragm. The magnetic field is furnished by a coil wound on a soft iron core. The magnetic path is completed through the outer shell of the instrument. The leads to the coils are brought in through a Bakelite block, and cooling air is intro-

duced through a tube. The diaphragm is directly exposed to engine cylinder pressure, and the change of pressure during the engine cycle results in a corresponding movement of the diaphragm and coil. This motion sets up an electromotive force in the coil which is proportional to the coil velocity. This velocity would be proportional to the rate of pressure change in the cylinder if the diaphragm and coil had no mass. The extent to which this ideal condition is approached depends upon the relation of mass to stiffness in the system, i. e., to its natural frequency characteristics and damping.

Measurement of glow ignition temperatures in high speed internal-combustion engines [trans. title], K. SCHNAUFFER (*Ztschr. Ver. Deut. Ingen., 77 (1933), No. 34, pp. 927–931, figs. 13*).—Experiments are reported the purpose of which was to determine the temperature of glow ignition of different fuel-air mixtures in a high speed internal-combustion engine. An effort was made to determine the temperature of the exhaust valves necessary to ignite the fuel mixtures during the brief interval when there is no spark. For this purpose a copper stud which could gradually be heated was screwed into the cylinder head of a motor run by external power. The mean temperature of the stud was indicated by a thermocouple. The method made it possible to determine the glow ignition temperatures of benzine-benzol-air mixtures in a running engine accurately to within 5° C.

The results showed that the glow ignition temperatures of benzine and benzol in an engine varied only about 5 percent. The activation energy required to ignite the two fuels varied very little.

However, the glow ignition temperature of benzine was found to be lower than that of benzol under the same conditions, and the glow ignition temperatures of mixtures of these two fuels lay between the glow ignition temperatures of the two fuels when used separately alone.

The glow ignition temperature of benzine-benzol-air mixtures increased at full load with increasing speed and was influenced by the compression ratio. This temperature also depended upon the throttle setting, the type of cylinder, and the proportion of residual gas present in the live gas mixture.

The effect of varying compression ratio and inlet temperature on engine performance, G. W. HOBBS and M. L. SUBLS (*Mich. Engin. Expt. Sta. Bul. 50 (1933), pp. 15, figs. 6*).—Investigations to determine the effect of such variables as air-fuel ratio, spark setting, temperature of intake air, and the like, on engine performance over a considerable range of compression ratios are reported.

The results show that the brake mean effective pressure is increased by increasing the compression ratio, and that the increase is much more pronounced at the lower than at the higher ranges. A very slight increase is registered between compression ratios of 7 to 8.65. The higher compression ratios give better economy (pounds of fuel per brake horsepower-hour) than the lower ratios. The general characteristics are the same as for brake mean effective pressure. The brake mean effective pressure increases with the spark advance up to the point of detonation, and beyond that point decreases rapidly. The rate of decrease in brake mean effective pressure after detonation begins increases with the compression ratio. Detonation is most severe when operating with an air-fuel ratio and with a spark setting that would give the maximum power if no detonation occurred. The spark setting and carburetor setting should be adjusted for each fuel in order to get the best results. The air-fuel ratio for maximum power and for maximum economy are independent of the compression ratio. Heating of the intake air or of the intake mixture does not

affect the air-fuel ratio for either maximum power or economy, but does increase the tendency to detonate.

The volumetric efficiency of the engine increases as the compression ratio decreases. The change in volumetric efficiency between low and high compression ratios is independent of the jacket temperature, and is the same when the engine is motoring as when firing. This increase in volumetric efficiency is caused by the inertia of the incoming charge. There is a greater pumping or ramming action operating with the increased total cylinder volume at the low compression ratios.

From constant brake mean effective pressure values on constant spark advance curves, it was found that the same power may be obtained from an engine by using a small spark advance and high compression or a greater spark advance and a low compression. It also holds that the increase of the usable compression ratio with retardation of ignition, when ignition is already late, is accompanied by a decrease instead of an increase in power. On the other hand, when the ignition is advanced the decrease of compression ratio necessary to use this advance is also followed by a decrease in power.

Some fuel and compression-ratio tests, H. N. Stapleton (*Agr. Engin., 15 (1934), No. 1, pp. 21, 22, figs. 2*).—The results of tests conducted at the Pennsylvania Experiment Station are reported in which a standard 15-drawbar horsepower tractor was used with the engine operating at from 600 to 1,800 r.p.m. and with compression ratios of 4.3, 5.1, and 5.9.

The data indicate that the improved performance from the higher compression ratios in the range tested is chargeable to a multiplied increase in efficiency. The first factor affecting ideal efficiency is the increased compression ratio. A second is the slightly higher air-fuel ratio which increased compression ratio seems to allow. Additional factors increase the percentage of ideal efficiency, which becomes actual, so that the proportional increase in actual efficiency is much greater than the increase in compression ratio.

Serious waste of fuel occurred using a compression ratio as low as the standard one of 4.3, since one pays for a grade of fuel capable of producing more power. The 24° spark advance for best power with the 4.3 compression ratio caused loss of power with the 5.1 compression ratio and very serious detonation with the 5.9 compression ratio. In this regard, all the limiting octane fuels required the same spark advance for the best power. The standard head required some change of spark advance in going from one fuel to the other.

Possible consequences of using highly antidetonating fuels in motors [trans. title], Bonnier and Moynot (*Compt. Rend. Acad. Sci. [Paris], 197 (1933), No. 23, pp. 1388–1390, fig. 1*).—The results of a series of experiments with a variable compression engine of the C.F.R. type using fuels with octane numbers varying from 64 up to 97 are reported, indicating the influence of these conditions on temperatures in the combustion chamber.

It was found that in the zone where detonation is perceptible to the ear the chamber temperature increases with the antidetonating value of the fuel and more rapidly as the compression ratio increases. Outside of this zone, that is, where detonation has practically ceased, the chamber temperatures remain practically constant. The temperature decreases naturally with a constant compression ratio, and more rapidly than the antidetonating value of the fuel.

The conclusion is drawn that the use of fuels of high antidetonating value does not have the same effect on all engines. Engines which detonate normally show marked increases of chamber temperature when the fuels are changed, whereas engines which are not much subject to detonation, such as truck and

tractor engines, do not show such large temperature variations with changes in fuel.

Influence of tetraethyl lead on knock rating, L. E. Hebl and T. B. Rendel (*Jour. Inst. Petroleum Technol., 18 (1932), No. 101, pp. 187–196, figs. 5*).—Tests with several different gasolines are reported. A factor *K* was deduced which is practically a constant over a wide range of different gasolines.

$$K = \frac{\log I - \log S}{\log N},$$

in which *I* is the increase in the highest useful compression ratio of a gasoline treated with tetraethyl lead, *S* is the effectiveness of tetraethyl lead in raising the highest useful compression ratio of any gasoline, and *N* represents the number of milliliters of tetraethyl lead added to one United States gallon of gasoline. It is considered likely, therefore, that the factor *K* may have some fundamental significance in the relationship between highest useful compression ratio and lead susceptibility.

Gum formation and its inhibition in motor spirits, W. H. Thomas (*Jour. Inst. Petroleum Technol., 18 (1932), No. 103, pp. 350–356*).—This is a summary of the findings of others on the subject, accompanied by a bibliography of 45 references.

The use of alcohol in motor fuel in foreign countries, C. Y. Hopkins (*Canad. Chem. and Metall., 18 (1934), No. 1, pp. 2–5*).—A review of the situation in 1933 in regard to the use of alcohol in motor fuel in foreign countries is presented by the National Research Council of Canada.

There are 11 countries in which motor fuel containing alcohol is being marketed. There are two types of legislation in effect in those countries which enforce the use of alcohol in motor fuel. The first requires that all motor fuel sold shall contain a certain percentage of alcohol. The second type requires all importers or refiners of gasoline to purchase a certain percentage of alcohol based on their handlings of gasoline. Five countries use alcohol in motor fuel on a voluntary basis, and the data show that in certain cases blended fuel containing alcohol is cheaper than pure gasoline. This does not necessarily indicate that the cost of alcohol is lower than the cost of gasoline, but rather that the taxes on gasoline are higher than those on alcohol used for fuel purposes.

The chief materials used for alcohol production in the 11 countries described are potatoes and cane molasses. Beet molasses, sulfite liquor, wood waste, and grapes furnish most of the remainder of the alcohol.

While the ordinary 95 percent alcohol is still used in Cuba and in the Philippines, the trend is decidedly in favor of absolute alcohol. It was found in Brazil that 95 percent alcohol was unsatisfactory, and the law was changed to specify absolute alcohol for future use. Similarly, use of the 95 percent grade in Natal was discontinued in 1932, and absolute alcohol has been used since that time.

While there was originally a wide variation in the proportion of alcohol to gasoline specified by the various governments, the tendency seems to be to fix the percentage of alcohol at from 10 to 20 percent of the mixture. Some of the earlier blends used in France and Germany contained from 30 to 50 percent of alcohol, but it is apparent that lower percentages have been found to be more satisfactory.

Heat effects in lubricating films, A. Kingsbury (*Mech. Engin. [New York], 55 (1933), No. 11, pp. 685–688, figs. 3*).—An analytical statement of the mathematical theory of heat effects is presented, and an effort made to verify the theory experimentally is described. A specially designed tapered-plug vis-

cometer is described and illustrated, and the results of experiments with mineral oil and olive oil are reported. These apparently verify the theory approximately.

Farm implements and machinery, S. J. WRIGHT (*Jour. Roy. Agr. Soc. England, 94 (1933), pp. 312–334*).—A review is presented of investigations conducted at various points during 1933 on power farming, harvesting, haymaking, tractors, root-crop machinery, soil heating, and spraying. Much of the work mentioned was conducted at agricultural experiment stations in the United States.

Industrial and labor management considerations in connection with the use of the tractor in agriculture [trans. title], DERLITZKI and NAUCK (*Schr. Reichskurator. Tech. Landw., No. 46 (1933), pp. 126, figs. 78*).—This is a report on a management study of the use of the tractor in German agriculture. A large amount of data and other information is presented and analyzed relating to tractor adaptation to secure high efficiency and economy in production practices.

Comparison between friction and conical roller bearings for farm wagons [trans. title], G. BOUCKAERT and C. DRICOT (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 2 (1933), No. 1, pp. 74–97, figs. 16; Dutch, Ger., Eng. abs., pp. 93–97*).—Tests conducted at Gembloux, Belgium, are reported.

In experiments on stone pavement and macadam it was found that the reduction in power and draft of wagons due to roller bearings diminished as the grade increased, but increased with the load for a given grade. The mean reduction of coefficient of traction due to roller bearings was 31.16 percent on stone pavement and 28.68 on macadam. On pavements with poor surfaces the coefficient of traction increased 17.19 percent with plain axles and 14.36 percent with roller bearings. The coefficient of traction was higher on macadam than on stone pavement.

Starting draft trials made on the same roads showed that with roller bearings the draft was practically proportional to the load, and that with plain axles the draft increased more rapidly than the load. The mean coefficients of starting with both types of bearings were greater on the pavement than on the macadam.

The reduction of the coefficient of traction obtained with roller bearings was greater in normal rolling on both pavement and macadam than in starting. The differences due to condition of the road surface were more important in starting than in normal rolling.

Field trials, while not conclusive, indicated a reduction of the coefficient of traction due to roller bearings.

Many experiments show how to apply fertilizer for best results, H. R. SMALLEY (*Fert. Rev., 8 (1933), No. 4, pp. 10–13, figs. 6*).—This is a brief summary of some of the more important results of an investigation into the mechanical placement of fertilizers being conducted by a joint committee, including among others the National Fertilizer Association, the American Society of Agricutural Engineers, the U.S.D.A. Bureaus of Agricultural Engineering and Chemistry and Soils, and several of the State agricultural experiment stations.

In general it has usually been found better to apply mixed fertilizer in bands at the sides of the row and slightly below the level of the seed than to apply it under the seed. For small grains light applications may be made with the seed. Too much mixing of fertilizer with soil is not good practice.

Much improvement is reported in fertilizer distributors and attachments.

New methods in electro-culture, S. S. NEHRU (*Jour. Roy. Soc. Arts, 82 (1934), No. 4234, pp. 231–252*).—An account is given of several experiments em-

ploying sparking, radiation, and radiomagnetic methods of electroculture with various crops, involving a consideration of so-called soil and plant "energetics." No very definite conclusions are drawn from the experiments, but recommendations are made as to equipment which may be used for the different methods proposed.

Electrically heated hot beds (*Connecticut [New Haven] Sta. Bul. 357 (1934), pp. 140, 141*).—The progress results of service tests of electrically heated hotbeds at the Windsor Substation are briefly presented.

Relation of electricity to poultry production: Electric brooders, L. F. Payne and C. A. Logan (*Manhattan: Kans. State Col., 1933, pp. 22, figs. 4*).—Experiments conducted in cooperation with the Kansas Committee on the Relation of Electricity to Agriculture are reported, the purpose of which was to determine (1) the comparative efficiency of the electric brooder with other types such as the oil- and coal-burning brooders, (2) the cost of operation of each brooder, and (3) the relative effects on the chicks.

Comparable results were obtained from all types of brooders. The electric brooder which had an insulated floor beneath the hover proved slightly better than either the coal or oil brooders, while the other electric brooder gave slightly inferior results. The electric brooder required very little time to install and regulate. The oil and electric brooders automatically maintained fairly uniform temperatures with very little care, but the coal stove was hard to regulate. It was necessary to tend the coal fire late at night to prevent the fire from going completely out. Chicks placed under electric brooders required careful attention for the first few days. They must be trained to go under the hover for warmth, and feed should be placed under the hover until the chicks have learned to eat. After the chicks once learned to eat and hunt the hover for warmth the electric hover required little attention.

The humidity is higher with electric brooding than with warm-room brooding, and in some instances it was high enough to produce considerable dampness. On cold mornings frost collected on the walls, and as the room temperature increased during the day water ran down the walls. It was necessary to change the litter in the houses where the electric brooders were used every two or three days during damp weather. The average room humidities for the houses where the electric brooders were used were 70 and 72 percent, while the average for the coal was 60 and the oil-burning 63 percent.

Under temperature conditions existing in this test, the cost for electric current at 3 ct. per kilowatt-hour was slightly more than coal, about the same as distillate, and less than kerosene. When the labor of taking care of the brooder is added to the fuel and energy charges, the electric brooders cost less than either of the other types.

Farm building costs and labor earnings, H. B. White and W. W. Neubauer (*Agr. Engin., 15 (1934), No. 1, pp. 16, 17*).—In a brief contribution from the Minnesota Experiment Station an effort is made to relate farm building costs with labor earnings on 20 dairy and 20 beef farms.

The results indicate a distinct advantage for the farm operator who has adequate buildings.

A study of 100 dairy barns in Wisconsin, M. A. R. Kelley (*Agr. Engin., 14 (1933), No. 10, pp. 271–273, figs. 8*).—In a contribution from the U.S.D.A. Bureau of Agricultural Engineering, the results of observations made in 100 barns subjected to the general weather conditions prevailing at the controlled test barn (E.S.R., 69, p. 441) are reported.

Two general facts are obvious from this study: (1) That weather changes affected the milk yield, which supplements the several other tests of this

nature; and (2) that the less known and more tangible factor, barn construction, may modify or nullify adverse weather effects and minimize the loss in milk yields.

The indications are that execessive drafts in a stable are dangerous and costly because of the risk of illness and possible loss of stock and the resultant loss in milk yield. A cool barn with clean stable air obtained without drafts is better than a warm, stuffy barn. Records obtained from fair barns well managed were better than good barns badly managed. The use of an excessive amount of glass area and excessive leakage of air hinders the control of stable temperatures. It was observed that windbreaks and natural shelters were of value in preventing rapid fluctuations of stable temperature and in reducing milk losses. The largest losses in milk yields occurred in climatically affected barns. Temperature variations as observed in this study are a major factor in fluctuations in milk yields. Most of the farms visited used water bowls to supply water to the cows. It appeared that the milk yields fluctuated more in those barns wherein the cows were turned out to water.

New developments in hog houses and equipment, F. Hale and H. P. Smith (*Texas Sta. Bul. 486 (1933), pp. 39, figs. 34*).—This bulletin describes and illustrates several new developments in hog houses and equipment adapted to Texas conditions. These include an improved A-type house adapted to all sections of the State. Improvements made on the shed-roof house were found to increase its adaptability to Texas conditions. Designs for extending the concrete floors 6 ft. beyond the outside walls of the half-monitor and gable-roof houses are a new feature which prevents mud holes and rooting along the foundation. Better door and window installation and arrangement have been added.

A simple and inexpensive hog breeding crate, covered water trough, and two types of adjustable self-feeders that aid in economical hog production are described. Other useful equipment described includes weighing and shipping crates, a loading chute, hog killing equipment, and smoke house. Plans and bills of material are given for all houses and equipment reported.

The equivalent temperature of a room and its measurement, A. F. Dufton (*[Gt. Brit.] Dept. Sci. and Indus. Res., Bldg. Res., Tech. Paper 13 (1932), pp. V+9, figs. 8*).—A method of measuring the effect on the comfort of a room of the temperature and movement of the air and the heat the body receives by radiation is described, using the eupatheoscope, which has been found to be a valuable instrument for this purpose. The data presented are of interest in connection with studies of the ventilation and heating of farm buildings.

Fences, hedges, gates, shelters, and stock-watering equipment on permanent pasture [trans. title], A. Limper and R. Limbach (*Schr. Reichskurator. Tech. Landw., No. 45 (1933), pp. 107, figs. 118*).—A large amount of practical information is given on fence and gate construction, on the construction of shelters, and on the selection and development of stock-watering places and equipment.

Sewage disposal, W. Rudolfs (*N.J. Agr., 15 (1933), No. 6, p. 8*).—Data on sewage chlorination are presented briefly, indicating that ordinarily when no careful control and no large volumes of dilution water are available chlorination up to residual chlorine is safest, but there are many places along the shore and larger rivers where, on account of dilution and with accurate control, partial chlorination may be sufficient. The studies have also shown that different sewages require different quantities of chlorine on account of varying organic substances present.

A study of coagulation as applied to sewage treatment, E. F. Eldridge and F R. Theroux (*Mich. Engin. Expt. Sta. Bul. 55 (1934), pp. 22, figs. 7*).—Laboratory studies and service tests of chemical coagulation of sewage as an adjunct to regular treatment are reported.

The laboratory studies indicated a definite pH zone in which ferric chloride coagulation of sewage is most effective. For the experimental sewage this was between 6.5 and 8.

There are two pH zones in which good removal of turbidity and suspended solids are obtained, one the higher optimum range and the other a much lower range. These two zones are separated by a zone of low removal, which may be due to a coagulation of sewage colloids at their isoelectric point without the aid of the ferric chloride. Ions extend the range of flocculation. Negative ions extend the range toward the lower pH values and positive ions toward the higher. Ions of higher valences have a greater effect on extending the range. Potassium permanganate in small amounts allowed the flocculation of a water at normal pH (7.8) when otherwise flocculation occurred at pH 4.5 to 5.5.

In the experimental plant work it was found that greater amounts of solids may be removed from sewage by the use of ferric chloride than by plain sedimentation. The removal of suspended solids increases with increasing doses of ferric chloride up to at least 1.25 grains per gallon. The removal for this dose was about 90 percent. The biochemical oxygen demand is greatly decreased, indicating the removal of organic colloids as well as suspended solids. Odors in the settled sewage are decreased by the use of ferric chloride.

Studies on the treatment of beet sugar factory wastes, E. F. Eldridge and F. R. Theroux (*Mich. Engin. Expt. Sta. Bul. 51 (1933), pp. 36, figs. [5]*).—The results of investigations extending over 2 yr. are reported which involved a study of some of the methods which could be applied to the treatment of the process water, which was found to contain the major portion of the organic matter discharged from the sugar beet factory. A summary of the results of work reported by others is also included, together with a bibliography.

Laboratory and experimental plant studies on chemical precipitation processes showed that the minimum quantity of lime required for coagulation of the colloidal materials was about 600 p.p.m. The addition of ferric chloride even in amounts as small as 15 to 20 p.p.m. gave much better clarification than when lime alone was used. The floc was much heavier and settled more rapidly, leaving a well-clarified supernatant liquor. The average reduction in biochemical oxygen demand after 30 min. settling was 71 percent, after 1 hr. 80 percent, and at the end of 2 hr. it gave practically no further removal. The degree of biochemical oxygen demand removal depends upon the sucrose content of the initial waste. With the average sugar content of about 400 to 500 p.p.m., a removal of from 80 to 82 percent was obtained with about 2 hr. settling.

Experiments on the activated sludge process showed that the outstanding factors which are not favorable to the use of the process for beet-sugar-factory process water are the difficulty of operation resulting from the tendency of the waste to foam and the high cost of the equipment necessary to provide a 12-hr. aeration period for a volume of waste twice that of the process water. With the equipment used in the studies, it was impossible to correct the foaming to the extent that it would not interfere with aeration.

Experiments on the digestion of mixtures of sewage and process water sludges showed that process water up to approximately 10 percent by volume may be mixed with sewage without having any apparent effect on the digestion of the sludge. Mixtures containing from 14 to 58 percent process water have

slightly retarding effects on gas production during the initial periods of digestion, but within 4 weeks produce approximately the same quantity of gas as that from sewage sludge containing the same weight of volatile matter. For a mixture containing as high as 70 percent process water the digestion action is very seriously retarded.

It is considered evident from these results that sugar beet process water can be added to sewage in approximately equal volumes without seriously affecting the digestion of the sludge.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Storrs Station, 1932–33] *([Connecticut] Storrs Sta. Bul. 192 (1933), pp. 3, 4)*.—Investigations are briefly reported as to the number of residence and full-time and part-time commercial farms, the relations of soil to location of dairy, vegetable, and deserted farms and the indebtedness on 136 tobacco farms.

Current Farm Economics, Oklahoma, [February 1934] *(Oklahoma Sta., Cur. Farm Econ., 7 (1934), No. 1, pp. 16, figs. 4)*.—Included are statements regarding the situation in agriculture in the State as follows: General, by R. A. Ballinger; dairy, by P. H. Stephens; cattle, by P. Nelson; and poultry and eggs, by Ballinger. Other articles are included as follows: A Summary of Family Living Expenditures on 562 Oklahoma Farms in the North Central Wheat Area in 1932–33, by O. D. Duncan, and Oklahoma Farm Price Relationships and What is Parity? both by Stephens.

[Investigations in agricultural economics at the South Carolina Station, 1932–33] *(South Carolina Sta. Rpt. 1933, pp. 13, 14, 16, 17, 98, 99, fig. 1)*.—Results not previously noted of investigations are reported on methods and price factors in marketing South Carolina hogs, by M. Guin, in which data obtained in the study previously noted (E.S.R., 68, p. 841) are given regarding time of marketing, number of sows bred, and alternative enterprises; the relation between assessed and actual value of South Carolina farm real estate, by G. H. Aull and E. Riley, in which a chart is included showing the relation of sales price and assessed value per acre of farm real estate in the State; and an income, savings, and investment and expenditure study of farm families in six counties of South Carolina, by M. E. Frayser, in which findings as to amount and sources of cash income and percentages of value of food produced on the farm and purchased and of cash income spent for food and shelter are given, as based on records kept by 46 farm women in 5 counties of the State.

[Papers presented at the fifth annual meeting of the Canadian Political Science Association] *(Canad. Polit. Sci. Assoc., Papers and Proc., 5 (1933), pp. 256)*.—Included are the following papers, dealing directly with agricultural economics, read at the meeting held at Ottawa, Ontario, May 22–23, 1933: Efforts to Control Marketing by Government Boards or Organizations Acting With Government Support, by J. Coke (pp. 90–105); Recent Legislation Affecting International Trade in Farm Products, by C. B. Davidson (pp. 106–126); The Functions and Responsibilities of Governments in Agricultural Marketing, by W. M. Drummond (pp. 127–144); and The Back to the Land Movement, by J. E. Lattimer (pp. 161–168).

Economic bases for the Agricultural Adjustment Act, M. Ezekiel and L. H. Bean *(U.S. Dept. Agr., 1933, pp. IV+67, figs. 38)*.—"It is the desire of the Department of Agriculture to bring home to the public generally a clear and thorough understanding of the economic and social justification for the policies set forth in the Agricultural Adjustment Act; how the methods and procedures provided by the act are directed to the fundamental difficulties; how these

methods and procedures provided by the act are based upon experience in previous attempts to correct the farm situation; that such methods and procedure rest on sound economic principles; that the agricultural recovery is only one phase of the whole recovery effort."

This publication "is a detailed statement prepared by the economic advisers to the Secretary of Agriculture showing the economic basis for the Agricultural Adjustment Act. Hence, it also includes a presentation of the broad economic policies laid down by the statute. In view of the important problems now facing the Nation, the material contained herein is significant. It emphasizes the emergency condition that surrounded agriculture and industry prior to the passage of the Agricultural Adjustment Act, but does not purport to describe the beneficial effects toward recovery since this and other measures have been in operation."

Economic and legal aspects of compulsory proration in agricultural marketing, E. A. Stokdyk (*California Sta. Bul. 565 (1933), pp. 44*).—This study was made to appraise the desirability and feasibility of compulsory proration programs as a means of increasing returns to California producers. The attempts to increase returns in recent years from lemons, Valencia oranges, Tokay grapes, lettuce, cantaloups, apples, and canning peaches through voluntary proration programs are described. Three possible administrative set-ups for making supply limitation effective, the probable legal status of proration in agricultural marketing, and the problems of administration of compulsory proration programs are discussed and an appraisal made of the desirability and feasibility of such programs.

An appendix includes the California Agricultural Prorate Act, approved June 5, 1933.

Prospects for agricultural recovery, I–V (*Iowa Sta. Buls. 310 (1933), pp. 15, figs. 4; 311, pp. 17–32, figs. 4; 312 (1934), pp. 33–64; 313, pp. 65–87, figs. 4; 314, pp. 89–128, figs. 5*).—The bulletins in this series "deal with the marked improvement that has taken place in industry since the low point of the depression early in 1933, and with the relatively small amount of improvement that has taken place in the condition of agriculture," and supplement the series on the agricultural emergency in Iowa previously noted (E.S.R., 69, p. 131).

Part 1, the economic situation in 1933, by G. Shepherd, describes the economic situation in 1933 and discusses the present conditions in agriculture and the probable future conditions. Part 2, refinancing farm mortgages in Iowa, by W. G. Murray, deals chiefly with the problems involved in refinancing farm mortgages in Iowa by the Federal Farm Credit Administration. Part 3, estimating advantages of the corn-hog plan to the individual farm, by J. A. Hopkins, Jr., explains the method of farm budgeting or planning. Part 4, national economic planning, by Shepherd, discusses the question whether the change from individualism to a policy of more social control under the Federal recovery legislation is an emergency expedient or a permanent change of policy.

Part 5, is our national farm plant too large, by T. W. Schultz, brings together "the more important economic facts that bear directly upon the apparent lack of balance between farm supplies and consumer demand." The first section, which discusses the agricultural consequences of the general crisis in trade since 1929, shows that (1) Iowa farmers have continued to produce during the depression at the same rate as in the more prosperous period before 1930; (2) the American people as a whole have continued to consume as much food per capita since the depression as during the period 1925–29; (3) domestic disappearance of nonfood farm products has decreased about 25 percent because of the depression; (4) the large accumulated stocks of nonperishable foodstuffs

have not resulted primarily from low wages and unemployment; (5) the large stocks of nonfood farm products are partly the result of reduced domestic consumption.

The second part deals with the dislocation in agricultural production and trade growing out of the World War. It discusses the farm relief measures in the United States, the shifts in the world acreages of crops, and hog slaughter, and the decline of agricultural trade as related to world trade barriers. The author concludes that "our national farm plant is too large for our present population and in spite of any reasonable curtailment will continue to be too large unless we reestablish foreign trade," and that the next phase in farm recovery involves two important steps, "first, the Federal Government must work out ways and means of putting into operation the basic principles of a sound commercial policy", and "second, because of the long strides that Europe has made toward self-sufficiency in foods, and because of the improvements in agricultural production technics in some of our competing countries, particularly in the countries growing wheat, it will be necessary to recognize that even though Europeans are able to earn dollars they will not take pre-war quantities of all of our farm produce."

Agricultural relief: A selected and annotated bibliography (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 50 (1933), pp. IV+382+[4]*).—This mimeographed bibliography, which is a revision and enlargement of bibliographies on the same subject and The Domestic Allotment previously noted (E.S.R., 61, p. 688; 69, p. 133), includes 2,252 references to books, Congressional committee hearings, Congressional reports and documents, addresses, reports, pamphlets, and periodical and newspaper articles. It does not cover agricultural indebtedness, the dependence of business on agriculture, or farm strikes.

Business and agriculture, 1920–1933: A partial bibliography of material on the interdependence of business and agriculture, compiled by V. E. Hitz (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 51 (1933), pp. IV+151+[3]*).—This is a bibliography including 448 references to books, pamphlets, editorials, and periodical, newspaper, and other articles dealing with the interdependence of agriculture and other industries.

Efforts to control marketing by government boards or organizations acting with government support, [I], II, J. Coke (*Sci. Agr., 14 (1933), No. 2, pp. 76–78, 91–94; (1934), No. 5, pp. 262–264, 278–280*).—These are the first two of three articles discussing governmental action in respect to control of marketing, particularly the creation of boards. The first discusses the Brazilian coffee valorization, and the second the Bulgarian cereal monopoly and the Chadbourne plan of sugar control (Cuba). The articles are in English and French.

Land and life: The economic national policy for agriculture, Viscount Astor and K. A. H. Murray (*London: Victor Gollancz, 1932, pp. 192, figs. 9*).—The condition of British agriculture and the need and essentials of a national agricultural policy and the present production policies for wheat and sugar beets are discussed. A long-term national policy, including livestock, meat, poultry and eggs, fruits and vegetables, dairying, land, small holdings, marketing, and research and education, is outlined.

The planning of agriculture, Viscount Astor and K. A. H. Murray (*London: Oxford Univ. Press, 1933, pp. [XVII+186, figs. 7*).—The steps taken in establishing a national policy for agriculture since the preparation of the publication noted above and some of the proposals for controlling agriculture and their possible effects on the national life of Great Britian are discussed in chapters as follows: The existing organization, the present discontent, self-

regulation or state control, price control, the problem of production control, reorganization of the farm, the farmer's part in marketing reorganization, the state and reorganization, artificial aid, and economic reconstruction.

The re-organisation of agriculture (*Oxford, Eng.: Conf. Agr. Organisers, St. John's Col., 1933, pp. [2]+123*).—Included are the following papers and discussions thereon delivered at the Conference of Agricultural Organizers held at Oxford University on July 11–14, 1933: The Regulation of Supplies in Relation to Agricultural Organisation, by A. W. Street (pp. 10–37); Pigs and Bacon Marketing Schemes, by E. T. Morris and A. E. Marsh (pp. 38–54); The Milk Marketing Scheme, by F. N. Blundell and T. Baxter (pp. 55–85); The Standardisation of Produce, by W. Lobjoit (pp. 86–101); and The Potato Marketing Scheme, by J. Mollett (pp. 102–119).

Development in Europe of tariffs and restrictions on international trade in cereals (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 24 (1933), Nos. 7, pp. 249–293; 8, pp. 297–330*).—The development and present status of the tariffs and restrictions in each country are described.

Agriculture, climate, and population of the prairie provinces of Canada (*Ottawa: Canada Bur. Statis., 1931, pp. 102, figs. 204*).—This statistical atlas, based on the 1926 census of the prairie provinces, presents by means of maps and charts, with interpretive comments, data as to the basic physical factors and the extent to which they account for the existing systems of agriculture and density and distribution of population; the changes in farming and the extent and condition of agriculture and distribution of field crops; livestock and animal products; farm incomes, expenditures, and values; and distribution, nativity, origin, educational status, and housing facilities of the population.

[Economic situation in Canada] (*Sci. Agr., 14 (1933), Nos. 2, pp. 72–75, 89–91; 3, pp. 149–153; 4, pp. 238–241; (1934), No. 5, pp. 259–261, 275–277*).—This series of articles give information in English and French regarding retail prices, employment, physical volume of business, agricultural products, etc.

The profitableness of farming in Scotland (*Edinburgh: Dept. Agr. Scotland, 1931, pp. 162, pl. 1*).—Included are (1) the first of a series of annual reports on the financial results obtained on certain groups of farms in Scotland (pp. 3–112), and (2) a statistical account of farms in the border counties of Berwick, Roxburgh, and Selkirk and their classification for the selection of sample groups from which to obtain accounting data (pp. 113–162).

The first part, which covers the years 1928–29, describes the origin and method of the inquiry and includes tables and discussions of the number, types, size, crops, livestock, volume and character of turn-over, volume of production, number of workers of different kinds, capital investment of owners and tenants, profits on different types of farms, the factors causing differences in profits, and adjustments suggested by the existing levels of prices and costs. The second part classifies 2,061 small holdings of various types.

[Profitableness of farming in Scotland] (*Edinburgh: Dept. Agr. Scotland, 1932, pp. 69; 1933, pp. 65*).—These are the second and third reports of the series noted above, and cover the financial results for the years 1929–30 and 1930–31, respectively. Each discusses the changes in farm organization, financial results, and factors causing differences in profits.

Utilization and cost of farm power in Georgia, J. R. Fain, R. H. Driftmier, W. A. Minor, Jr., and M. P. Jarnagin (*Ga. Agr. Col. Bul. 434 (1933), pp. 55, figs. 32*).—In this study made by the University of Georgia in cooperation with the Bureaus of Agricultural Economics, Agricultural Engineering, and Animal Industry U.S.D.A., "to determine the kind, amount, utilization, and cost of power on farms in Georgia," usable records were obtained from 80 com-

bination (using both tractors and mules) and 92 mule farms in the Coastal Plains, Piedmont plateau, Limestone Valleys, and Appalachian Mountains sections of the State. Analysis is made to determine the number and kinds of tractor implements used, size of teams on different operations on different size farms, tractor and mule hours used on different crops on different size farms, costs of operation of teams, tractors, and trucks, etc.

Harrowing with disk harrows was the principal drawbar use of tractors. Cultivation was done chiefly with a Haman stock and one mule. The average cost of tractor power was 87 ct. per hour, varying from 78 ct. in the Coastal Plains region to $1.20 in the Limestone Valleys region. The cost of mule power averaged 16 ct. per hour, varying from 13 ct. in the Coastal Plains to 22 ct. in the Limestone Valleys and from 14 ct. on mule farms to 18 ct. on combination farms. Truck operations cost 10 ct. per mile, and the average yearly mileage was 3,009 miles. Costs begin to be prohibitive with less than 500 tractor hours, 1,500 truck miles, or 75 days per mule per year. On an average, a tractor displaced 3.6 mules. On farms of less than 300 crop acres, the displacement was approximately one mule. Combination farms had 13.3 percent more animal units other than work stock and 12.5 percent higher yields of crops than did mule farms.

Cost of tractor operation on prairie farms in western Canada, E. G. Grest (*Sci. Agr., 14 (1933), No. 2, pp. 83–85, 99–101*).—Data on the operation of 256 tractors are analyzed and discussed in English and French. Tables show operating costs, hours of operation per year, costs of different field operations, etc.

Farm profits and factors influencing farm profits on 55 dairy farms in Warren County, A. G. Waller and E. Rauchenstein (*N.J. Agr. Col. Ext. Bul. 105 (1933), pp. 18, fig. 1*).—This study, made in cooperation with the U.S. Department of Agriculture and the New Jersey Experiment Stations, is based on reports obtained in a survey of 55 dairy farms in two areas of Warren County covering the year 1930. The changes in agriculture in the county from 1880 to 1930 are described. Tables covering the year 1930 summarize the farm business of all farms of each area and for 4 individual farms. They show the distribution of capital; expenses, by items; the grain fed per cow, per head of young stock, per horse, and per hen; and the variations in labor incomes and the factors associated with such variations. Estimates are made of the receipts and expenses of 55 farms and the 4 individual farms in 1931, 1932, and 1933.

Large dairy herds, high production per cow, efficient feeding and larger number of eggs sold per hen were associated with the larger net incomes. No farm with a labor income above $2,500 in 1930 sold less than 8,000 lb. of milk per cow, while three fourths of those with labor incomes of less than $499 averaged less than 7,000 lb. per cow. Net receipts per farm declined from $1,713 in the Stewartsville area and $1,510 in the Blairstown and Vail area in 1930 to $445 and $571, respectively, in 1932 and estimated amounts of $275 and $221, respectively, in 1933. Products used for family living in 1930 were valued at an average of $283 per farm. Labor incomes in 1930 averaged $1,097 and $1,137, respectively, in the two areas.

The cost of producing milk in Rhode Island, J. L. Tennant (*Rhode Island Sta. Bul. 241 (1934), pp. 16, figs. 3*).—Records of the quantities and costs of feed; hours and value of man and horse work; miles and costs of truck and automobile use; number and value of bulls, heifers, calves, and cows raised, purchased, and sold; costs of new equipment, repairs, etc.; and quantities of milk produced, sold, etc., were obtained from 39 farmers for the

year ended January 31, 1933. Analysis is made of the average amounts and costs of feeds, labor, etc., per cow and per 100 lb. of milk for all herds.

The average costs of producing milk per 100 lb. were for all herds $2.79, ranging from less than $2 to over $4; for herds producing less than 7,400 lb. per cow, $3.11; and for herds producing over 7,400 lb. per cow, $2.58. The cost for feed was 42 ct. less and the man labor required 0.3 hr. less in the high- than in the low-producing group. In the herds fed silage the feed cost was 4 ct. higher and man labor requirements 0.1 hr. less per 100 lb. of milk, and production per cow 449 lb. more than in the herds not fed silage. The man labor per 100 lb. of milk was one half hour less and the production of milk per hour of labor 10.4 lb. greater on the farms using milking machines than on the other farms.

Feed constituted 50 percent, man labor 21.4 percent, overhead 10.8 percent, net replacements 7 percent, depreciation of herds 6.9 percent, and other items 3.9 percent of the average costs of all herds. Man labor averaged 165 hr., horse work 0.6 hr., and truck mileage 21.7 miles per cow.

The cost of manufacturing cheese in Ontario, J. F. Booth and C. V. Parker (*Sci. Agr., 14 (1934), No. 5, pp. 269–272, 285–289*).—This is the first of a series dealing with the economic side of the manufacture of cheese. It is based on data applying to the 1931 operations of 125 Ontario cheese factories. Tables are included and discussed showing the costs of manufacturing and the effect of volume on such costs. The article is in English and French.

Origin, distribution, and market price of the commercial watermelon crop, J. W. Strowbridge (*U.S. Dept. Agr., Tech. Bul. 398 (1933), pp. 60, figs. 13*).—Statistics are included showing, by carloads by States, for the years 1922–31, the commercial acreage, production, shipments, shipping season, etc., and the average carload unloads and consumption, 1926–30, in 66 markets, by months and State of origin. More detailed analysis is made of the supply to the New York City, Chicago, Philadelphia, St. Louis, Cleveland, Boston, and Buffalo markets and of the supply and prices and their relation in New York City and 12 of the leading markets.

Population development, wheat production, and wheat trade of the world, W. Henkelmann (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 24 (1933), No. 11, pp. 423–479, pls. 6, figs. 4*).—The population development, wheat production, and consumption of wheat in the principal European wheat-importing countries and the principal overseas wheat-exporting countries, together with the importations into the former and the exportations from the latter, are discussed.

Cattle marketed in North Dakota, 1929–30–31, and some factors underlying their production, H. G. Anderson and A. H. Benton (*North Dakota Sta. Bul. 275 (1933), pp. 51, figs. 20*).—"The results of a 3-year study on the classes and grades of cattle marketed from North Dakota are presented in this bulletin. It also contains a brief discussion of the trends in crop production, livestock production, and the cattle industry in particular, with an indication of the types of cattle to be found on farms. It also points to the existence of cattle producing areas which are differentiated by certain fundamental conditions and the changes likely to take place in the cattle industry with the forward movement in diversified agricultural production."

The data for 1929 were previously noted (E.S.R., 67, p. 616). Tables and charts show the classes of cattle marketed, market uses, and weights and grades of North Dakota cattle, much of the data being by countries.

The effect of butter and cheese supplies on "surplus" milk prices, R. L. Cohen and K. A. H. Murray (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst.,*

1933, pp. 19, figs. 5).—The consumption of home-produced and imported milk and milk products in Great Britain, the sources of imports, the relation between the price of butter f.o.b. New Zealand and butter supplies in Great Britain and between the price of cheese f.o.b. New Zealand and the cheese supplies in Great Britain, and the effects on total returns to New Zealand of different plans for restricting butter and cheese imports are discussed.

Secondary milk markets in Massachusetts in the period of falling prices, 1930–1932, D. Rozman (*Massachusetts Sta. Bul. 304 (1933), pp. 20, figs. 3*).—This is a study of the milk marketing set-up and the changes which have taken place since 1930 in three cities of 15,000 to 22,000 population (Gardner, Attleboro, and Newburyport). Data were gathered in 1932 regarding supply and sale of milk, location of producers and distributors, and marketing machinery with price plans of producers, dealers, and distributors. Tables and charts show for each city the sources of milk supply, production and purchases by producer-distributors, size of herds, family and hired labor, sales of other products by producer-distributors, average daily sales by dealers and producer-distributors, price plans and prices paid, cost of distribution, distance to market and miles traveled daily by producer-distributor, etc. Some of the findings were as follows:

With modern transportation and increased competition of outside areas, the secondary markets cannot maintain their independence from conditions in larger markets. In a period of depression and unemployment, the disorganization of small milk markets results both from more producers entering the distribution field and from the pressure of milk from outside areas. Attempts to maintain the price level independently of the general market trend or to limit the influx of outside milk are not likely to prove successful. Excess of farm labor, lack of other income, and low milk prices have attracted smaller producers into becoming distributors.

The average net 1932 summer prices received by producers in the cities studied ranged from 4.1 to 6 ct. per quart. The average cost of distribution for producer-distributors, not including labor, was 1.3 ct. per quart. Selling milk to small dealers and distributors is deemed the most economical type of marketing machinery for a secondary market. To maintain stability in a small market in a depression period, local dealers should reduce the spread between retail prices and prices paid producers sufficiently so that too many producers will not enter the distributing field.

Business analysis of the combined operations of twenty-five co-operative dairy companies in Canada, A. E. Richards (*Sci. Agr., 14 (1933), No. 2, pp. 79–82, 94–98*).—Tables are included and discussed showing the combined balance sheets, net worth, indebtedness, business and plant value, operating statement, and distribution of net income. The article is in English and French.

[Agricultural cooperation] (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 24 (1933), Nos. 5, pp. 153–168; 10, pp. 401–416; 12, pp. 483–498*).—The following articles continue the series previously noted (E.S.R., 69 p. 610): Estonia (pp. 153–168); Lithuania (pp. 401–416); and Latvia (pp. 483–498).

The farm real estate situation, 1932–33, B. R. Stauber (*U.S. Dept. Agr. Circ. 309 (1933), pp. 68, figs. 9*).—This is a continuation of a study previously noted (E.S.R., 69, p. 133), and covers for the most part the year ended March 1, 1933.

The index of estimated value per acre of farm real estate was 73 percent, a decline of 16 points from the previous year. The decline in the New England States varied from 8 to 17 points, averaging 11; Middle Atlantic States from 8 to 18 points, averaging 14; East North Central States from 7 to [illegible]

points, averaging 11; West North Central States from 7 to 22 points, averaging 17; South Atlantic States from 7 to 28 points, averaging 16; East South Central States from 14 to 19 points, averaging 18; West South Central States from 13 to 24 points, averaging 16; Mountain States from 10 to 20 points, averaging 18; and Pacific States from 16 to 24 points, averaging 22. The estimated gross income from farm production during 1932 was 26 percent below that for 1931.

The number of farms per 1,000 of all farms changing ownership by voluntary sales and trades during the year ended March 15, 1933, was 16.8 as compared with 16.2 for the previous year; the number changing hands by delinquent tax sales was 15.3 as compared with 13.3; and those by foreclosures, bankruptcy, etc., was 38.8 as compared with 28.4. Voluntary sales decreased in the New England, East North Central, West North Central, Mountain, and Pacific sections. Sales for delinquent taxes increased in all sections except the East North Central and Pacific, the most notable increase being from 21 to 27.3 in the East South Central section. Forced sales other than for delinquent taxes increased from the former year in all sections, the larger changes being from 27.8 to 38.3 in the East North Central States; 43.8 to 61.5 in the West North Central States; 24.6 to 36.4 in the East South Central States; and 26.8 to 36 in the Pacific section.

The number of farmer bankruptcies in the year ended June 30, 1932, was 21 percent greater than during the previous year.

Farm credit and farm real estate taxes, residence and occupation of purchasers and purpose of purchase in case of voluntary sales, and the relative changes in value per acre of farm real estate, 1910–20, 1920–30, and 1910–30, by size of farm and value per acre, are discussed.

An analysis of farm leases for the Corn Belt and Wheat Belt States, H. C. M. Case (*St. Louis, Mo.: Amer. Life Conv., 1932, pp. 63*).—Analysis is made of 41 leases in current use in the Corn Belt and 29 in the Wheat Belt with a view to pointing out differences and suggesting simplifications. New or additional provisions are discussed, and suggestions are offered for simplifying the wording of present leases.

Credit conditions and the indebtedness of agriculture in central and eastern European countries, G. Costanzo (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 24 (1933), No. 6, pp. 197–243*).—The credit conditions and agricultural indebtedness are discussed by countries.

Extent of the representative character of farm accountancy statistics, J. Deslarzes (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 24 (1933), No. 10, pp. 387–400, figs. 3*).—A study is made of the reliability of the averages in Farm Accountancy Statistics published by the International Institute of Agriculture (E.S.R., 69, p. 612).

Principal sources and uses of State and county revenues in Alabama, J. D. Pope (*Alabama Sta. Circ. 63 (1934), pp. 8, figs. 4*).—Included are four charts with explanatory text showing for the period October 1, 1932–September 30, 1933, the sources of revenues and distribution of expenditures of the State government and the State and county governments combined.

Taxation in Minnesota, R. G. Blakey et al. (*Minn. Univ. Studies Econ. and Business, No. 4 (1932), pp. XII+627, figs. 70*).—Included are the following chapters dealing with taxation of agriculture: The tax situation in Minnesota—a summary of major problems, farm real estate assessment in Minnesota, the tax burden of agriculture, tax delinquency and the cut-over land problem in northern Minnesota, and taxation of forest property.

Some aspects of the farm tax situation in Ontario, S. C. Hudson (*Sci. Agr., 14 (1934), No. 5, pp. 265–268, 281–284*).—Tables are included and dis-

cussed showing the index numbers of farm taxes, 1906–32, and the prices of farm products, 1913–32; the distribution, by 5-year periods 1901–31, of the farmer's tax dollar to county, township, and school purposes; and the trends, 1907–31, and distribution, 1902–31, of expenditures of the united Counties of Stormont, Dundas, and Glengarry, by 5-year periods. The article is in English and French.

Crops and Markets, [February 1934] (*U.S. Dept. Agr., Crops and Markets, 11 (1934), No. 2, pp. 33–72, figs. 3*).—Included are tables, charts, summaries, reports, etc., on livestock and livestock products, dairy and poultry products, cold-storage holdings, fruits and vegetables, grain, hay, feed, seeds, cotton, the price situation, and price movements of important agricultural products.

Other tables show the number, farm price per head, and total value, January 1, 1932–34, by States, and the monthly farm prices, January 15, 1910, to December 15, 1933, of different kinds of livestock; the average prices received by farmers for farm products on January 15, 1933–34, by States; the average monthly hog-corn ratios, January 1910 to January 1934, and by States, 1931–33; the daily average number of pounds of milk per cow in herds of crop correspondents, February 1, 1932–34; the indexes of farm wages, by States, January 1932–34; the number of persons employed per farm at different dates, July 1, 1932, to February 1, 1934; the farm labor supply and demand, by States, January 1, 1933–34; and other data as to crops and livestock.

Wisconsin farm prices, 1841 to 1933, W. P. MORTENSON, H. H. ERDMAN, and J. H. DRAXLER (*Wisconsin Sta. Res. Bul. 119 (1933), pp. 80, figs. 11*).—This bulletin, prepared in cooperation with the Bureau of Agricultural Economics, U.S.D.A., and the Wisconsin Crop and Livestock Reporting Service, includes average monthly and yearly prices for the period 1841–1933 of 34 important Wisconsin farm products, including different field crops, livestock, poultry livestock and poultry products, and honey, and index numbers, 1843–1932 with constant and variable weights for quantities of dairy products, livestock cash crops, poultry products, grains, and unclassified products.

The prices used are the averages for representative local markets and were obtained from newspapers, business and farm records, State and Federal reports, trade journals, etc.

The cost-of-living index number: Method of compilation (*London: Min. Labor, 1931, pp. 13*).—The method used by the Ministry of Labor of Great Britain in compiling its cost-of-living index number is described.

RURAL SOCIOLOGY

Our economic society and its problems, R. G. TUGWELL and H. C. HILL (*New York: Harcourt, Brace & Co., 1934, pp. IX+566, figs. 171*).—This is a study of American levels of living and how to improve them. Parts 1 and 2 are "a survey of the historical background of our economic life, after which a detailed and concrete picture of our present levels of life is given instead of the usual analysis of classical economic concepts." Parts 3 to … inclusive, deal with ways of raising the present levels of rural and urban living by improving methods of production and the conduct of business affairs, by redistribution and wise use of income, by international cooperation, and by considering alternatives to laissez faire.

Each chapter is followed by a list of questions and problems for class use and references for supplemental reading in a library consisting of selected volumes.

Social science research organization in American universities and c…, … W. GEE (*Va. Univ., Inst. Res. in Social Sci., Inst. Monog. 19 (1934),* …

IX+275).—"This volume, the first systematic attempt to portray the social science research organizational situation in American universities and colleges, is offered to college executives and those in the social science profession with the hope that it may in some small way aid toward the intelligent promotion of the cause of social science research in our institutions of higher learning."

[Investigations in rural sociology at the South Carolina Station, 1932–33] (*South Carolina Sta. Rpt. 1933, pp. 6–9, 95–97*).—Investigations not previously noted are reported on occupational mobility among farmers, by B. O. Williams, in which data are included for 224 owner and 76 tenant families in Pickens County; and on the attitude of high school seniors toward farming and life on the farm, by M. E. Frayser, in which analysis is made of information obtained from 924 high school seniors.

Rural social organization in the rice area, T. C. McCormick (*Arkansas Sta. Bul. 296 (1933), pp. 43*).—This is the second of a series of studies of rural social organizations in Arkansas (E.S.R., 69, p. 745).

The interests of the 349 farm families interviewed centered chiefly in villages and cities, the indexes being 39 percent each for villages and cities and 22 percent for the open country.

The education of heads of families interviewed averaged less than eight years. The better educated members of all families tended to leave the farm. Farm people made few affiliations with urban clubs and chambers of commerce but joined parent-teacher associations, the American Legion, and lodges to some extent. A greater amount of participation occurred in religious activities than in any other type studied. The longest distances were traveled for health, economic, and recreational services; the shortest to educational, religious, and social events. Only newspapers afforded the farm people any contacts beyond an average circle of 10 to 15 miles radius around the neighborhood. Age and automobile ownership had more effect upon participation of farm people at religious, social, and recreational events than any other factors. Other things equal, youth and automobiles each multiplied attendance by three. Age affected attendance of members of laborers' families most and that of members of farm owners' families least. The automobile was a powerful force in taking the trade of the people away from the small villages and transferring it to the only city in the area. The small villages, however, continued to be much more important than the large villages as centers of the social interests and elementary education of the farming class.

The farm families of this section were inclined to go wherever their interests took them, rather than limit themselves to neighborhood affairs, resulting in a scattered and unintegrated type of social organization. Beyond a farm men's club with about a dozen members from the area, the class interests of the masses of the farmers were without any medium of organized expression or action.

Some social and economic features of American Fork, Utah, L. Nelson (*Brigham Young Univ. Studies No. 4 (1933), pp. 73, figs. 7*).—This is the third in a series of studies designed to give a description of typical rural Mormon villages or communities (E.S.R., 54, p. 288; 60, p. 387).

American Fork, settled in 1850, is located in the leading agricultural county of Utah and is 30 miles from Salt Lake City. While its economic foundation was agriculture, American Fork Canyon, only a few miles from the townsite, contains rich ores which have contributed much to the economic life of the city.

Mention is made of the two land systems of Utah, one established in 1847 by the Mormons and the Federal system which is superimposed upon it. The small individual holdings and the divided holdings constitute interesting charac-

teristics of Mormon land tenure. Tenancy is not a significant factor in the Mormon community at the present time.

As in the case of practically every Mormon community, the economic life is, to a large extent, dependent upon grazing land adjacent to the valleys. Part of these lands are administered by the National Forests, where restricted grazing is allowed under permit. There are also vast areas of public domain which are used by the livestock men for winter range.

While the population of American Fork has grown steadily, it is rapidly approaching the point where no further increase can take place.

The results of these studies point definitely to the need for an enlarged program of social research to reveal more specific trends in village development.

The migration problem in its relation to agriculture (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 24 (1933), No. 9, pp. 333–379*).—The course of the migration movement before and after the World War, the causes of the present position of the movement and its effect are discussed for Canada, Germany, Italy, Poland, Sweden, the United States, and less extensively for other countries.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Summary of measurement studies in agricultural education, H. M. HAMLIN (*Agr. Ed. [Des Moines], 6 (1933), Nos. 5, pp. 74–77, 80; 6, pp. 90–93, 96*).—Seventy-five studies of research work are summarized and discussed under the following headings: Surveys, studies of graduates, measurement of outcomes of work with organized class groups, miscellaneous measurement studies, discussions of measurement technic, and present status of measurement in agricultural education.

Criteria for evaluating content in home economics, B. I. COON (*Jour. Home Econ., 26 (1934), No. 3, pp. 142–148*).—Fourteen criteria are outlined for evaluating work in home economics offered in secondary schools.

Agricultural marketing, H. F. HOLTZCLAW (*New York: Ronald Press Co., [1931], pp. XI+429, figs. 18*).—This textbook for classes in marketing covers the principles of marketing, the mechanism and methods used in the agricultural field, the special problems of each class of agricultural products, the various functions of the agricultural marketing process, prices, and marketing costs.

FOODS—HUMAN NUTRITION

Vitamins and other dietary essentials, W. R. AYKROYD (*London: William Heinemann, 1933, pp. [7]+218*).—This volume is somewhat more comprehensive than its title would indicate, for the vitamins receive no more attention than do the other equally essential dietary factors. The early chapters follow the customary sequence of calories, proteins, carbohydrates, and fats, after which the vitamins are discussed in several chapters covering the discovery of the vitamins, vitamin A, beriberi, pellagra, scurvy, vitamin D, osteomalacia, and diet and teeth. A chapter on minerals in nutrition completes the discussion of the food essentials. The remaining chapters, which should be of particular interest to the general reader, discuss the dietary values of foodstuffs, factors governing the dietary habits, the relation of nutrition to physique and health, the ill effects of malnutrition, particularly in the Tropics and the East, and the essentials of a perfect diet. The text is presented so simply and interestingly that the reader who completes the book will undoubtedly agree with the author that "on the whole the principles of dietetics are easy to understand."

Food, nutrition, and health, E. V. McCollum and J. E. Becker (*Baltimore: Authors, 1933, 3. ed., rewritten, pp. V+146*).—A revision of the popular nontechnical handbook noted previously (E.S.R., 61, p. 87).

Japanese foods commonly used in Hawaii, C. D. Miller (*Hawaii Sta. Bul. 68 (1933), pp. 43, figs. 22*).—This bulletin describes the preparation, use, and general nutritive value of many Japanese foods common in Hawaii. A few carefully selected recipes, with calorie values, are included for the use of dietitians and physicians, and a table is appended giving proximate and mineral analyses, including NaCl, Cl, P, and Fe, for the various foods discussed. Photographs are included illustrating many of the foods described.

The oxalic acid content of plant food materials [trans. title], E. M. P. Widmark and G. Ahldin (*Biochem. Ztschr., 265 (1933), No. 4–6, pp. 241–244*).—Tabulated data are presented on the oxalic acid content, as determined by the method of C. G. Holmberg,[1] of the edible portion of various food materials of plant origin, including leaves and stems, leaves without midribs, fruits and berries, root vegetables, mushrooms, and cereal grains.

The spectrographic analysis of milk ashes, H. Blumberg and O. S. Rask (*Jour. Nutrition, 6 (1933), No. 3, pp. 285–288*).—Spectrographic analyses by a slight modification of the method of Tourtellotte and Rask (noted on page 9) of 19 samples of cow's milk, chiefly commercial 1-qt. bottles from dairies in Baltimore, Pittsburgh, New York City, and the District of Columbia, gave the following results:

Calcium, magnesium, phosphorus, potassium, and sodium were found in large quantities in all of the samples examined. Elements found in traces in all of the samples included barium, boron, copper, iron, lithium, rubidium, strontium, titanium, and zinc. The presence of aluminum and manganese could not be demonstrated definitely, although these elements were present in the feed mixture. The presence or absence of silicon and vanadium could not be established definitely on account of their presence in the graphite electrodes used.

Effect of the ripening process of cheese on the nutritive value of the protein of milk curd, J. R. Beadles, J. H. Quisenberry, F. I. Nakamura, and H. H. Mitchell (*Jour. Agr. Res.* [*U.S.*], *47 (1933), No. 12, pp. 947–965*).—In feeding, digestion, and metabolism experiments at the Illinois Experiment Station on rats four varieties of cheese (Cheddar, Roquefort, Swiss, and Limburger) were compared with fresh rennet curd from cow's milk.

It was found that by the ripening involved in cheesemaking the digestibility of the protein of the curd is lowered from 1 to 2 percent, but the capacity to promote gains in weight is not lowered. The biological value of the protein of Swiss cheese is practically the same as that of rennet curd, i.e., 73, while that of the Limburger protein is about 6 percent lower than this. By means of carcass analyses it was shown that the depressed digestibility of the protein of the cheese without impairment of weight increase is explainable by the fact that these increases are made up of less protein and more fat than those produced by milk curd protein. This observation, that equal gains in weight may differ appreciably in composition, is evidence of a variable which should be considered in the exact interpretation of any feeding experiment. In other tests using a cystine supplement it was shown that in Limburger cheese, at least, cystine is the amino acid limiting the biological utilization, the same being true of casein itself; also that the ripening process involves a destruction of cystine and of at least one other indispensable amino acid.

The utilization of pimiento pepper in the diet, L. Ascham (*Georgia Sta. Bul. 179 (1933), pp. 16, figs. 7*).—This bulletin contains a brief historical account of the introduction of the pimiento into the United States and its increas-

[1] Biochem. Ztschr., 182 (1927), No. 5–6, pp. 463–469.

ing production; a summary of the value of the pimiento as a source of vitamins A (E.S.R., 70, p. 566), B, and C; a discussion of the effects of a deficiency of vitamin A in the diet; and practical suggestions, with recipes, for including the pimiento in the diet. Several illustrations in color add to the attractiveness of the publication.

Pimento peppers and vitamin A (*Jour. Amer. Med. Assoc., 101 (1933), No. 25, pp. 1972, 1973*).—Editorial comment on Georgia Experiment Station Bulletin 177 (E.S.R., 70, p. 566).

Fruits in ice cream and ices, W. V. Cruess, W. C. Cole, and M. A. Joslyn (*California Sta. Circ. 331 (1933), pp. 32, figs. 6*).—In this circular more attention is given than in Bulletin 434 (E.S.R., 58, p. 289), which it replaces, to the general principles involved in the use of fruits and fruit products in ice creams and ices. The composition of a satisfactory mix for fruit ice creams is given, methods for calculating overrun and determining the maximum overrun for ice cream sold in California are explained, and general directions are given for adding fruits to ice cream mix, sweetening fruits, and using suitable coloring and flavors judiciously. The fruits and fruit mixtures described and methods recommended differ only in minor details from those in the previous publication.

Ultra-violet irradiation stimulates yeast activity, W. L. Owen (*Food Indus., 5 (1933), No. 7, pp. 252–254, figs. 3*).—Evidence is presented leading to the conclusion that "a baker's yeast, given a limited exposure to the action of ultraviolet rays falling between the limits of 2,300–3,100 a.u., has a definite acceleration and a greater sustained fermentation activity than untreated yeast of the same origin; also that as a result of this greater sustained fermentation activity, irradiated yeast is capable of producing a greater leavening effect than untreated yeast and, as a consequence, the quantity of yeast required to produce the normal rate of fermentation can be reduced by 24 percent; and, finally, that the leavening effect of irradiated yeast upon the proofing time for bread dough shows that the quantity of yeast required can be reduced by 24 percent with an actual saving of time in the majority of the experimental tests made."

Food budgets for nutrition and production programs, H. K. Stiebeling (*U.S. Dept. Agr., Misc. Pub. 183 (1933), pp. 15*).—This publication, which has been adapted from U.S.D.A. Circular 296 (E.S.R., 70, p. 416), presents (1) restricted diets for emergency use, (2) adequate diets at minimum cost, (3) adequate diets at moderate cost, and (4) liberal diets, and discusses the per capita requirements of various foods or food groups needed for the population of the United States according to the four suggested diets, together with the acreage required per capita to produce the foods entering into these diets.

Unemployment and food (*Lancet [London], 1933, II, No. 24, pp. 1323, 1324*).—In this editorial, under date of December 9, 1933, attention is called to the fact that in the unemployment insurance bill presented to Parliament the weekly allowance per child is 2s., whereas the B.M.A. committee report noted previously (E.S.R., 70, p. 718) fixes 2s. 6d. as the minimum weekly food allowance for young children, with steady increases to from 5s. to 6s. for a boy 14 years and over. The apparent discrepancy between the insufficient allowances for food and the statement of the Ministry of Health that "there is at present no available medical evidence of any general increase in physical impairment, in sickness, or in mortality" is discussed, with the suggestion that to some extent the discrepancy is due to inadequacy of the criteria used in judging good and bad nutrition. Another explanation is that the statutory benefits have often been supplemented by school meals

and milk distribution, and the plea is made that if such supplementary feeding is necessary it should be readily accessible to all who need it instead of being at the discretion of local authorities. The opinion is advanced that "it is impossible to justify the underfeeding of children in any part of this country at a time when food production is being restricted through the lack of markets."

Food habits of rural school children in relation to their physical well-being, A. P. Brown (*Utah Sta. Bul. 246 (1934), pp. 52, figs. 22*).—This bulletin reports a study of the diet and physical status of school children in six rural communities in Utah. The data were collected during the school years of 1929–30 and 1930–31 and include monthly weights, heights at the beginning and close of the school term, and menus for two days each month during the school year. Statements of food likes and dislikes, health habits, and communicable diseases were obtained once a year. Physical and dental examinations were also made by local physicians and dentists.

The dietary information obtained by means of the menu sheets was evaluated by the score card developed by Davies (E.S.R., 59, p. 790). The highest score of the 891 diet records was 88, the lowest 21, and the mean 53.6. A total of 77 records scored 70 or above. The low scoring food groups in all of the records were milk, green and leafy vegetables, the group comprising raw fruits, raw vegetables and canned tomatoes, and the whole grain products. The average daily milk consumption per child was 1 pt., but 0.9 percent of the entire group used no milk and 15.4 percent less than 1 glass daily.

The food habits records, chiefly in terms of frequency of consumption of various foods, were obtained from 910 children. These records agreed closely with the menu records for milk, 82 percent reporting the consumption of some milk daily. Other customary habits were eating raw garden vegetables in the growing season (73.2 percent), fruit between meals (57.6 percent), and bread and butter or jam between meals (48.2 percent). The boys showed a preference for milk, cooked vegetables, and whole grain products, and the girls for green and raw vegetables and fruits. There was a tendency for the diet scores to decrease as the age increased, with a noticeable drop at 11 yr.

"The dental examination showed a high incidence of dental caries, inflamed gums, abscesses, and fistulas in connection with decayed and neglected baby teeth. A few cases of pyorrhea were encountered. Thirty percent of the cavities in permanent teeth had been filled, showng some appreciation of the importance of proper care for these teeth. Physicians' examinations showed a wide range of defects, among them faulty vision, diseased tonsils, enlarged thyroid glands, spinal curvatures, and faulty skeletal development. Each child examined had one defect or more. Age appeared to be an important factor in distribution of some specific physical defects. Both boys and girls were below average weight for age and height (Baldwin-Wood tables). The girls were farther below average than were the boys."

A separate study of 16 children of the seven families included in a previous dietary study (E.S.R., 61, p. 891) showed slightly higher diet scores than did the larger group, and the average milk consumption was somewhat higher. In comparison with other similar studies reported in the literature, the author concludes that the Utah children show no marked departure in diet and in physical status from what is usual among school children. The average diet is believed to be adequate in fuel value, but of doubtful adequacy in vitamins and mineral content because of the scant use of vegetables, raw foods, and whole grain products.

Feeding the patient—your problem and mine, M. W. Northrop (*Med. and Prof. Woman's Jour., 40 (1933), No. 11, pp. 326–329*).—The mutual responsibility

of the physican and the dietition in planning adequate diets for hospital patients is discussed from the dietitian's standpoint.

A study on the effects of fatty acid on nutrition, U. Tange (*Inst. Phys. and Chem. Res. [Tokyo] Sci. Papers, 20 (1932), No. 399, pp. 13–28, figs. 10*).—Previously noted from another source (E.S.R., 69, p. 751).

Human milk studies.—XIV, A critique of the determinations of nitrogenous constituents, B. N. Erickson, N. Stoner, and I. G. Macy (*Jour. Biol. Chem., 103 (1933), No. 1, pp. 235–248*).—In this paper of the series noted previously (E.S.R., 67, p. 624), a modification of the sodium tungstate sulfuric acid precipitation procedure for the separation of nonprotein from protein nitrogen, suitable for use in the analysis of human milk, is described, and comparative data are reported on the nonprotein nitrogen of human milk filtrates prepared by the modified procedure and by precipitation of the proteins with trichloroacetic acid.

In all cases the nitrogen in the trichloroacetic acid filtrates was higher than in the filtrates from the tungstic acid precipitation. This was thought to point to the presence of polypeptides in the milk. To determine whether these are inherent constituents of breast milk or are gradually formed through the proteolytic action of native enzymes, a comparison was made of the tungstic acid and trichloroacetic acid filtrates of human milk prepared directly after its removal from the breast and at successive intervals thereafter. The filtrates prepared immediately after removal of the milk from the breast showed sufficient differences to denote the presence of polypeptides in the fresh milk. These differences increased gradually with increase in time before precipitation, indicating that proteolysis was taking place. An enzyme capable of converting urea into ammonia was also demonstrated.

Attention is called to an abnormal sample of human milk containing very high nonprotein nitrogen and showing accelerated proteolysis upon standing, observations agreeing with similar observations on abnormal samples of cow's milk.

The acidity of gastro-intestinal contents of vegetarian and omnivorous rats, S. Wan (*Chinese Jour. Physiol., 7 (1933), No. 2, pp. 179–184*).—No significant differences were found between the pH values of the feces and gastrointestinal contents of rats on the omnivorous and vegetarian diets used in the series of studies noted previously (E.S.R., 70, p. 559).

The role of tryptophan in blood development, R. S. Alcock (*Biochem. Jour., 27 (1933), No. 3, pp. 754–758, fig. 1*).—"Rats kept on a tryptophan-deficient diet over prolonged periods failed to develop anemia. Young rats suffering from milk anemia recovered from this anemia independently of the presence of tryptophan in their diet."

The influence of fasting on the concentration of blood lipids in the albino rat, B. Sure, M. C. Kik, and A. E. Church (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 417–424, figs. 3*).—Data are reported showing that in the rat during fasting, with free access to distilled water, there occurs a progressive decrease in the concentration of blood, fatty acids, and lecithin and no demonstrable change in the blood cholesterol.

The availability of iron from different sources for hemoglobin formation, C. A. Elvehjem, E. B. Hart, and W. C. Sherman (*Jour. Biol. Chem., 103 (1933), No. 1, pp. 61–70, figs. 3*).—A comparison is reported of the availability of the iron in different types of iron salts and a few food materials, as determined by the Hill dipyridyl method (E.S.R., 64, p. 712), and by feeding rats rendered anemic by the method of Elvehjem and Kemmerer (E.S.R., 67, p. 90).

According to the dipyridyl method, 100 percent of the iron in ferric chloride, pyrophosphate, and hypophosphite was in an available form. The percentages of available iron in other materials tested were ferric glutamate 88 percent,

oats 57, and wheat and yeast 47 percent each. Glutamic acid parahematin contained no available iron.

In the feeding tests each rat received 0.05 mg of copper daily as copper sulfate along with the iron supplement, and in the tests with iron salts each rat was also given 0.04 mg of $MnCl_2.4H_2O$ daily. Oats fed in amounts furnishing 0.3 mg of total iron per rat daily produced an increase of 6.8 g of hemoglobin in 6 weeks as compared with an increase of 12.5 g on ferric chloride furnishing the same amount of iron daily. These figures are consistent with the relative proportions of available iron in oats and ferric chloride, respectively. Yeast fed in amounts furnishing 0.3 mg of total iron produced a much slower increase in hemoglobin than that obtained with 0.3 mg of iron as ferric chloride, but on increasing the yeast to 1.94 g furnishing 0.3 mg of available iron, as calculated from the dipyridyl determination, the rate of hemoglobin formation was practically identical with that of the iron salt. Similar results were obtained in comparisons of other foods. The available iron determined by chemical and feeding methods showed good agreement for all the foods tested except egg yolk, which is being studied further.

The authors conclude that the studies reported have established two facts, first, that the value of various foods as a source of iron cannot be based entirely upon their total iron content, and second, that various forms of nonhematin iron, including insoluble salts, are superior to hematin (organic iron) as a source of iron for the body.

"Hematin compounds have no place in the group of therapeutic agents used for hypochromic anemias. This does not mean that all the available compounds are equally valuable. Other properties such as taste, toxicity, etc., are important factors. We have found ferric pyrophosphate to possess many fine qualities. The iron in pyrophosphate is not only available, but it is held in such firm combination that it does not produce the astringent effects so characteristic of other iron salts. This salt may also be valuable in cases of anemia with achlorhydria because it is soluble in neutral solutions and may be more readily assimilated in the absence of hydrochloric acid."

"Available" iron in therapy (*Jour. Amer. Med. Assoc., 101 (1933), No. 27, pp. 2123, 2124*).—Editorial comment on the investigation noted above.

New formed hemoglobin and protein catabolism.—Conservation of intermediates in the anemic dog on a protein-free diet, F. S. DAFT, F. S. ROBSCHEIT-ROBBINS, and G. H. WHIPPLE (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 495–510*).—The authors have determined the rate of hemoglobin regeneration in dogs rendered anemic by bleeding, according to the technic described previously (E.S.R., 53, p. 866), during periods of fasting, or sugar feeding with or without the addition of iron, or the intravenous injection of colloidal ferric hydroxide. During the course of the experiment urine analyses were made daily or every other day.

Considerable hemoglobin was formed during the fasting and sugar feeding, and this was increased from a minimum of 50 g to a maximum of 150 g during periods of iron and sugar intake. The nitrogen required for the hemoglobin formation is thought to come from an increase in tissue catabolism and from a more complete conservation of nitrogenous intermediate products. The latter is shown by a decrease in the urea-ammonia fractions in the urine.

Hemoglobin production.—IV, Evaluation of therapeutic agents in anemia, due to milk diets, based on a study of the blood and bone marrow of rats from birth to maturity, T. FITZ-HUGH, JR., G. M. ROBSON, and D. L. DRABKIN (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 617–628, figs. 3*).—In this continuation of the series of papers noted previously (E.S.R., 67, p. 92) "are presented determinations of hemoglobin, red cells, and reticulocytes of the blood, and estimations of the relative cellularity of the red bone marrow (1) in nor-

mal rats from birth to 150 days of age under standard laboratory conditions, (2) in rats on an exclusive milk diet begun at an average age of 27 days and maintained for as long as 120 days, and (3) in rats rendered anemic by 45 days of milk feeding and then treated by supplementing the milk with iron, iron and copper, and iron and sodium glutamate, the therapy being initiated at an average age of 70 days and continued for about 75 days, a therapeutic period considerably longer than usual."

The data, which are presented graphically, are interpreted upon the basis of the normal blood picture of adult (140-day) stock rats of the author's colony, the values for which are given as 15 to 16 g hemoglobin per 100 cc, 8,000,000 red cells per cubic millimeter, and reticulocytes about 10 pecent (±5), or 800,000 per cubic millimeter of blood.

During the course of anemia due to the milk diet, the hemoglobin fell more rapidly and reached a lower relative level than the red cells. The reticulocytes increased. Values obtained in an anemic rat of 140 days of age were hemoglobin 2 g per 100 cc. red cell count 2,200,000 per cubic millimeter, and reticulocytes 26 percent.

Following iron therapy alone, there was a persisting reticulocytosis (20–25 percent, or 1,600,000 per cubic millimeter), very incomplete hemoglobin recovery, and poorly sustained red cell recovery, although much better than that of hemoglobin. With iron-copper therapy there was almost complete return to normal of reticulocytes, hemoglobin, and red cells, the red cell recovery again being more complete than that of hemoglobin. With iron-sodium glutamate therapy, the recovery of reticulocytes, hemoglobin, and red cells was the most complete of any of the groups. During the therapy by all three methods, the fall in reticulocytes did not begin immediately. The peaks of the "reticulocyte crisis" occurred after about 20 days of treatment by iron alone, 11 days on iron and copper, and from 3 to 8 days on iron and sodium glutamate.

The data on the cellularity of the bone marrow were very consistent with the blood data, particularly the percentage of reticulocytes. On the stock diet during early life, when the percentage of reticulocytes was high, the bone marrow was proportionately highly cellular, and both decreased with maturity. During anemia the cellularity of the bone marrow, though variable, was higher than normal. At the beginning of therapy there was a marked increase in cellularity, which was greatest in the case of iron-sodium glutamate administration, and this was followed by a decrease to normal values except in the case of iron therapy alone.

The data are considered to confirm the theory that iron therapy is ineffective in milk anemia of rats, and that though both iron-copper and iron-sodium glutamate are effective, neither brings about a permanent cure of the anemia. Inasmuch as the copper content of the glutamic acid was shown to be negligible, it is considered that the effectiveness of iron and sodium glutamate therapy cannot be attributed to copper contamination.

Some considerations regarding and investigations into calcium and phosphorus metabolism, J. P. McGowan (*Biochem. Jour., 27 (1933), No. 3, pp. 934–942*).—Factors affecting phosphorus and calcium metabolism are discussed from certain phenomena observed in the investigation noted on page 139 from other observations in the literature, and from a series of CaO and P_2O_5 balance experiments on rabbits reported in the present paper. The conclusions drawn from the various sources of information are summarized essentially as follows:

"The most important single factor controlling the absorption of Ca and P appears to be the acidity of the gastric juice. Subject to this condition, the most important factor influencing the absorption of P seems to be an excess of Ca in the diet, which, having neutralized the HCl, precipitates P as $Ca_3(PO_4)_2$.

"The optimum conditions for the simultaneous absorption of Ca and P seem to be those where, in the presence of adequate HCl, CaO and P_2O_5 exist in the diet in moderate and approximately equivalent amounts and in such quantity that the amount of Ca is considerably short of that required for the neutralization of the HCl.

"For the optimum utilization of Ca and P after absorption, it seems to be requisite that they should be supplied in the food uncombined with one another and that they should be absorbed as far as possible in this condition." There is considered to be no ground for the assumption that in general there exists a reciprocal or inverse relationship between the calcium and phosphorus concentrations of the blood. These concentrations are thought to be the resultant of factors of absorption, excretion, and endogenous fixation. Howland and Kramer's Ca × P index of normality is said to be invalid.

The data presented are thought to be in accord with the theory that rickets is caused by a deficiency in phosphorus.

Some notes on vitamin units, H. E. Munsell (*U.S. Dept. Agr., Bur. Home Econ., 1933, pp. 4*).—This mimeographed material includes definitions of the vitamin units now in general use in the United States and of the provisional international vitamin units, and methods tentatively proposed by the committee of revision of the U.S. Pharmacopoeia for assaying liver oils for vitamins A and D, with specifications for the vitamin A and D potency of commercial products such as cod-liver oil and Haliver oil.

Vitamins in milk (*Lancet [London], 1933, II, No. 23, pp. 1269, 1270*).—In this editorial comment on the paper by Sherman noted previously (E.S.R., 70, p. 725), the statement is made that "though it is perhaps true that in the United States of America supplementing of the infant's diet with vitamin D is adequate to bring about normal development, it is doubtful whether in this country complete reliance can be placed on milk for the supply of the various other vitamins required by the growing child."

The nutritive value of the opihi, C. D. Miller (*Hawaii. Acad. Sci. Proc., 7 (1932), Bernice P. Bishop Mus. Spec. Pub. 20, pp. 19, 20*).—The opihi (*Helcioniscus exaratus* and *H. argentatus*), a shellfish widely used by ancient Hawaiians and at present available on the Honolulu markets, is shown to be an excellent source of vitamin A and a good source of vitamin D. In the vitamin A tests 0.5 g of fresh opihi per week gave nearly as good results as cod-liver oil, and in the D tests 4 g of opihi fed daily for 8 days to rats which had been on the Steenbock rachitic diet for 21 days brought about complete healing, as shown by the line test. The glandular organs were even more effective in both A and D tests. The sperm was richer in vitamin A than the eggs, but neither was as good a source as the organs. The sperm was slightly richer than the eggs or organs as a source of vitamin D.

Studies of the nutritive value of opihi (Helcioniscus exaratus and H. argentatus).—II, Hemoglobin regeneration in anemic rats fed opihi, C. D. Miller (*Hawaii. Acad. Sci. Proc., 8 (1933), Bernice P. Bishop Mus. Spec. Pub. 21, pp. 11, 12*).—In this continuation of the investigation noted above data are reported showing that the opihi has only slight hemoglobin-regenerating properties when fed in quantities of from 4 to 8 g daily to rats rendered anemic on a milk diet. Analyses by R. Robbins showed a high (0.0134 percent) content of iron and a low (0.00023 percent) content of copper in the fresh material. On supplementing opihi with 0.01 mg of copper daily more satisfactory results were secured in the hemoglobin-regenerating tests.

These studies have been noted in progress reports of the Hawaii Experiment Station (E.S.R., 67, p. 473; 69, p. 747).

This extensive review of the literature on vitamin A is presented under the headings history and nomenclature, physiological action, detection, distribution of vitamin A and carotene, the stability of vitamin A and carotene, carotene (provitamin A) and carotenoids, and vitamin A from liver oils. Much of the material in the last two sections is drawn from the extensive investigations of the senior author and various associates. Structural formulas are included for the various carotenoids and for vitamin A. Extensive references to the literature are given both as footnotes and as a bibliography.

Fat-soluble vitamins.—XXXVIII, Microorganisms and the synthesis of carotene and vitamin A, C. A. Baumann, H. Steenbock, M. A. Ingraham, and E. B. Fred (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 339–351, figs. 2*).—This continuation of the series of papers noted previously (see p. 6) reports a further examination of the yellow *Corynebacterium* demonstrated by Skinner and Gunderson (E.S.R., 68, p. 415) to have the property of synthesizing a vitamin A-active substance from an inactive substrate, together with analyses for carotene with confirmatory feeding tests of cultures of other yellow organisms.

Carotene was identified in all of the organisms tested, but in no case did it constitute all of the yellow pigment. The proportion of carotene to total yellow pigmentation varied from 6 to 50 percent, varying not only with the strain of the organism, but also with age, rate of growth, freshness of the culture, and composition of the culture medium. As judged by the growth experiments with rats, the amount of carotene present was sufficient to account for the entire vitamin A activity. Attempts to transform carotene into vitamin A by the organisms studied were unsuccessful.

Attention is called to the similarity between these organisms and plants rather than animals, although they differ from plants in not requiring the presence of chlorophyll activity for the synthesis of carotene.

Vitamin A and carotene.—X, The relative minimum doses of vitamin A and carotene, T. Moore (*Biochem. Jour., 27 (1933), No. 3, pp. 898–902, fig. 1*).—The biological activities of β-carotene and a highly purified vitamin A concentrate prepared from turbot-liver oil by alcohol saponification, followed by removal of the sterols by crystallization and precipitation by digitonin, were compared in paired feeding tests. The probable quantity of pure vitamin A in the concentrate was calculated from the intensity of the absorption band at 328 mμ. The carotene and the vitamin A concentrate were both administered in coconut oil solution in quantities of 0.1, 0.3, 1, and 3γ daily for the carotene and amounts corresponding to the same concentration of vitamin A for the vitamin A concentrate.

As shown by growth curves, the responses to corresponding doses of β-carotene and the vitamin A concentrate were very similar at all levels. On the highest dosage, 3γ, good growth resulted in every rat, 3 for each test. At the 1γ level growth was less rapid, and 1 rat receiving carotene declined and died after 7 weeks. At the 0.3γ level the responses were irregular but similar for both test materials, and at the 0.1γ level all of the rats except 1 died.

The data are thought to prove that, contrary to views widely held, carotene is utilized in the body as efficiently as vitamin A at levels approaching the minimum. Attention is called to the advisability of using doses approaching the minimum in any comparison of biological activity.

Limits of the anti-infective value of provitamin A (carotene), S. W. Clausen (*Jour. Amer. Med. Assoc., 101 (1933), No. 18, pp. 1384–1388, figs. 7*).—The method followed consisted in observing the level of plasma carotenoids in a large group of children and correlating these levels with known susceptibility of the children to repeated respiratory infections. In the report of the study

attention is first called to various factors which affect the level of plasma carotenoids. The administration of carrot purée, 0.5 oz. twice a day, is usually followed by a marked rise in carotenoid pigments in the blood of healthy infants, but by little or no rise in others suffering from diarrhea or fever. Infants who have not received vegetables, egg yolk, or top milk mixtures have a low level of blood carotenoids, but after the age of about 2 yr. the average level is higher and nearly constant, dropping to low values with infection.

In the investigation proper, 1,322 children over 2 yr. of age were studied. On grouping together the children whose plasma carotenoid levels were considered to be low, medium, and high, it was found that the apparent susceptibility to repeated respiratory infections fell with the rise in the level of carotenoids to a certain point, after which it rose. Not more than from 5 to 10 percent of the susceptibility to infection of the children studied could be attributed to a low level of carotenoids, but the increased susceptibility among children with a high carotenoid level was thought to suggest a possible injurious action of carotene in large amounts.

Data are also reported on the vitamin A content of the livers of 70 children at autopsy. The livers of older children who had died of severe infections had a lower vitamin A content than those of children who had died of other causes. Analyses of the livers of rats in the course of another investigation by O. R. McCoy of the effect of a deficiency of vitamin A on susceptibility to infection with trichinosis showed that the livers of the older rats might be greatly depleted of their stores of A without marked loss of resistance, but that the younger rats were much more susceptible to infection. The administration of cod-liver oil, which increased the resistance of the rats to infection, also raised the vitamin A content of their livers.

The author expresses the opinion in conclusion that under ordinary circumstances sufficient vitamin A is provided in infancy by a diet which contains milk and cod-liver oil from the second week of life and vegetables from the fifth to the sixth month, and that children over 2 yr. of age are likely to receive a diet containing sufficient vitamin A. "When rapid storage of vitamin A is desired, halibut-liver oil, or cod-liver oil, would seem more suitable than preparations of carotene because of the more rapid absorption of vitamin A than of carotene. Carotene is poorly absorbed in the presence of fever or diarrhea."

Discussion of the paper by H. J. Gerstenberger and I. N. Kugelmass is appended.

Does our dietary require vitamin A supplement? A. F. Hess, J. M. Lewis, and L. H. Barenberg (*Jour. Amer. Med. Assoc., 101 (1933), No. 9, pp. 657–663, fig. 1*).—The question of the need of supplementing the ordinary diet by vitamin A was approached in several ways, including an extension of previous clinical observations (E.S.R., 67, p. 482) of the relative incidence of winter respiratory troubles in groups of children in the same institution on the ordinary diet and the same diet supplemented with generous amounts of vitamin A (Haliver oil and carotene), similar observations on the relative incidence of mild summer respiratory troubles and of impetigo in vitamin (cod-liver oil) and control groups in the same institution, an inquiry noted from another source (E.S.R., 70, p. 877), into the extent of night blindness in the United States, and a review of studies reported in the literature.

From all these observations the authors conclude that the average child does not require any supplement of vitamin A above what it receives in 24 oz. of milk, and that the American dietary is not deficient in vitamin A. "As in the case of all vitamins, the demand is greatest during early childhood and probably again at puberty. But, as to the requirements of thousands of units of vitamin A

which, happily, will prove to be only a passing fad." It is noted, however, that a lack of vitamin A may result from vagaries of diet or defective absorption as, for example, in diarrhea or jaundice.

The vitamin B complex and high protein diets, F. T. G. PRUNTY and M. H. ROSCOE (*Biochem. Jour., 27 (1933), No. 3, pp. 699–704*).—In this reinvestigation of the disputed question of the relation between protein intake and requirements of the B vitamins, two experiments were conducted. In one the effect was studied of two levels of protein intake, 20 and 70 percent, in conjunction with adequate vitamin B_1 and varying amounts of B_2 fed separately. In the other the same concentrations of protein were used with 10 percent of yeast extract incorporated in the diet to furnish both vitamins B_1 and B_2.

In the first series of experiments growth was the same at any given intake of vitamin B_2 whether the protein was 20 or 70 percent and in spite of the fact that the rats on the high protein ate considerably less than on the low. The incidence of dermatitis was not affected by the percentage of protein. The weights of the kidneys were proportional to the percentage of protein and were not affected by the amount of vitamin B_2.

In the second series the rats on the high protein diet again ate less than those on the low protein, but did not grow as well. This is attributed to their lowered intake of the yeast extract.

The results are thought to indicate, as had previously been shown for vitamin B_1 by Sure, Kik, and Smith (E.S.R., 67, p. 484), that vitamin B_2 has a direct effect on growth independent of any effect on appetite. Other conclusions were that hypertrophy of the kidneys of rats on high protein diets is independent of the vitamin B_2 supplied, and that dermatitis characteristic of vitamin B_2 deficiency is not affected by a high protein diet.

A study of the sparing action of fats on the vitamin B content of animal tissues, A. R. KEMMERER and H. STEENBOCK (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 353–362*).—Rats, pigs, and chicks were used in this investigation of the disputed question of the sparing effect of fat for vitamin B. The general plan consisted in comparing for vitamin B content various tissues and organs of these animals after subsistence for definite periods of time on low vitamin B-low fat and low vitamin B-high fat diets. For purposes of comparison the responsiveness of rats to the international standard vitamin B was also tested.

One unit (10 mg) of the international preparation caused an average weekly increase in weight of 11.8 g in rats on standard vitamin B-free diets. In normal rats and chicks 2 g of muscle tissue and from 0.25 to 0.5 g of liver contained approximately 1 international unit of vitamin B. The dark meat of chickens was higher in vitamin B than the light muscle. Pork ham as purchased in the market furnished from 7 to 8 times more vitamin B than rat or beef muscle, but similar tissue from a young pig contained considerably less than the market ham. The vitamin B content of the muscle and liver of all of the animals was lower on vitamin B-deficient than normal diet, but was not affected by the proportion of fat in the diet, although the rats maintained a higher caloric intake and lost less weight on the high fat than the low fat diet.

These results are considered to disprove the theory that fat has a sparing action on vitamin B.

Vitamin B deficiency and the atrophic tongue, A. M. HUTTER, W. S. MIDDLETON, and H. STEENBOCK (*Jour. Amer. Med. Assoc., 101 (1933), No. 17, pp. 1305–1308, figs. 7*).—Following a brief review of the literature presenting various hypotheses as to the cause of glossitis of the tongue with atrophy of the lingual papillae, laboratory tests on a dog to determine the influence of vitamin A and on rats of vitamin B on the tongue are reported pointing to a deficiency

of vitamin B as the causative factor. This was tested clinically by the administration of vitamin B in large doses to patients suffering from atrophy of the tongue in connection with pernicious anemia and other pathological conditions. Three reports of the result of this treatment in pernicious anemia show in one instance a prompt response to the high vitamin B intake without specific therapy for the anemia, in the second no response on the high vitamin B diet without anemia therapy but slow response on low vitamin B with liver therapy, and the third a similar response to low vitamin B and liver.

"These characteristic experiences lead to the conclusion that the atrophic tongue is dependent on a vitamin B deficiency. Experimentally the condition has been regularly reproduced in rats on a vitamin B deficient ration. Clinically, the problem is not as clear cut. Instances of pure vitamin B deficiency will respond to an excess of the lacking substance. If the deficiency is conditioned by factors of impaired absorption and assimilation, the addition of the deficient vitamin to the diet may not be sufficient in itself to overcome the basic fault."

The evaluation of vitamin B_1 concentrates by the rat cure method, F. F. Heyroth (*Bul. Basic Sci. Res., 4 (1932), No. 1–2, pp. 1–34, figs. 3*).—Following a critical review of the literature on vitamin B (B_1) determinations, curative rat tests are reported as applied to several vitamin B_1 concentrates, and the requirements for accurate results in the use of this method are discussed.

The distribution of vitamin C in plant and animal tissues, and its determination, O. A. Bessey and C. G. King (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 687–698*).—Certain modifications in the 2, 6-dichlorophenolindophenol titration method for determining vitamin C, as proposed by Tillmans and associates (E.S.R., 69, p. 7), are described, important among which is the use of freshly prepared strained lemon juice for the standardization of the indicator. Precautions which must be taken in the extraction and titration of plant and animal tissues and the limitations of the test are discussed, and comparisons are given of dye titrations and animal assays in determining the vitamin C content of a wide variety of substances.

In the authors' opinion the titration method is "more accurate than the biological assay method for investigating most plant and animal tissues in that it is sensitive to smaller differences. However, the dye titration method is valuable only when properly interpreted from a consideration of the chemical nature of the material being titrated and the possible sources of interference."

Among the experimental data given are comparisons of dye titrations and guinea pig tests of crystalline vitamin C, lemon juice, raw and heated milk, cooked peas, and tomato juice. A dosage of 0.5 mg of vitamin C is considered the most satisfactory protective feeding level for quantitative studies. In comparison with this, approximately the same values were obtained with 1 cc of lemon juice, 8 g of cooked peas, and 2.5 g of tomato juice. Raw milk was not protective against scurvy in doses of 30 cc and furnished only 0.3 mg of vitamin C by the titration method. Various other fruits and vegetables showed good correlation in dye titration and animal tests. Among these the highest values reported by the titration tests were parsley 1.76, green pepper 1.80, and ripe red pepper 2.3 mg per gram. Among the materials with low values were old potatoes 0.08, head lettuce 0.05, canned spinach 0.05, canned peas 0.05, and canned green beans 0.04 mg per gram.

Determinations of the vitamin C content of various tissues of guinea pigs after 10 days on excess vitamin C and 15 days on a vitamin C-free diet, respectively, showed rapid depletion of the C reserves on the vitamin C-free diet. The vitamin C content of similar tissues of animals not requiring vitamin C,

including rats, rabbits, chickens, and hens, showed a fairly consistent relationship in distribution among the different organs and tissues. This also held for the few human tissues examined. The adrenals are consistently high, followed by brain, liver, ovaries, and testes with relatively high concentration, and then in decreasing order by heart and kidneys, muscle tissue, and blood.

The corpus luteum of hogs contained approximately as much vitamin C as the adrenal cortex, a finding "of particular interest in corroborating the general physiological relationship of the vitamin to (1) a high respiratory rate, (2) complex lipids, and (3) rapidly growing tissue. It minimizes the probability of a direct specific relation to the adrenal cortex, which has been considered frequently because of its high concentration there."

The antiscorbutic potency of certain foods (*Jour. Amer. Med. Assoc., 101 (1933), No. 17, p. 1319*).—This editorial, based chiefly on the report of Birch et al. noted previously (E.S.R., 70, p. 741), emphasizes the very low ascorbic acid content of cow's milk in comparison with other antiscorbutics. It shows that, based upon relative content of ascorbic acid, "it may require from 1 to 2 oz. of fresh cow's milk to afford the antiscorbutic protection inherent in less than 2 cc (less than half a teaspoonful) of orange or lemon juice. Even at its best, therefore, a milk diet calls for supplementation with an effective antiscorbutic."

The antiscorbutic potency of apples, VI, T. Wallace and S. S. Zilva (*Biochem. Jour., 27 (1933), No. 3, pp. 693–698*).—A further investigation of the possible relationship between the nitrogen content and vitamin C potency of apples (E.S.R., 65, p. 896) is reported in which the nitrogen content in the two varieties previously used was varied by two methods—substituting "grass" for arable culture and bark-ringing vigorous trees. A survey of the usual guinea pig feeding tests showed consistently higher antiscorbutic activity in the case of the apples of lower nitrogen content, in some cases the vitamin C content being raised as much as 1½ to 2 times by either method. Although the nitrogen content and activity of the apples were always inversely related, there was no strict proportionality between the two. There was no correlation between the vitamin activity and the content of acids, sucrose, and ash.

The ascorbic acid content of the adrenals and livers of different animals, J. L. Svirbely (*Biochem. Jour., 27 (1933), No. 3, pp. 960–963*).—Data obtained by the Tillmans method, as modified by Birch et al. (E.S.R., 69, p. 169), are reported on the ascorbic acid content of the livers and adrenals of the pig, ox, calf, and sheep; of dogs and cats fed meat only; of rabbits, white mice, and rats fed diets free from vitamin C; and of guinea pigs on diets of varying vitamin C content.

The quantities of ascorbic acid reported are in fair agreement with the known antiscorbutic activity of the various organs as reported in the literature. In all cases the ascorbic acid content of the adrenals per gram of body tissue was much higher than that of the liver. The ability of certain animals to store ascorbic acid on diets free from vitamin C as compared with the inability of the guinea pig to do so is shown by the folowing values reported for the ascorbic acid content of the adrenals of various animals on a vitamin C-free diet: Rabbit 1.83, white mouse 2.4, rat 5.2, and guinea pig 0.07 mg per gram of tissue. In guinea pigs fed liberal amounts of spinach and then placed on a vitamin C-free diet, the ascorbic acid content of the livers decreased before that of the adrenals, indicating that the liver serves as a reserve store for ascorbic acid.

In guinea pigs fed sugar beets and a vitamin C-free diet for 2 weeks, but showing no signs of scurvy on autopsy, the ascorbic acid values of various organs and tissues were adrenal 0.18, liver 0.016, kidney 0.04, heart 0.006, spleen 0.05, and leg muscle 0.001 mg per gram of tissue.

The tolerance of infants for ascorbic acid (crystallized vitamin C) [trans. title], E. KRAMAR (*Deut. Med. Wchnschr., 59 (1933), No. 37, pp. 1428, 1429*).—Crystalline ascorbic acid was administered, with no ill effects, to 18 infants from 10 days to 1 year of age. Healthy infants were given from 25 to 50 mg, the newly-born from 20 to 25 mg, and premature infants and twins 15 mg daily. The ascorbic acid was well tolerated even by infants with fever and digestive disturbances, conditions in which fruit juices as a source of vitamin C would not be tolerated in large amounts. It is noted that 5 mg of the ascorbic acid is equivalent to about 8 cc of orange juice.

The production of vitamin D by irradiation of ergosterol through the epidermis of a rat, N. S. LUCAS (*Biochem. Jour., 27 (1933), No. 1, pp. 132–135, pl. 1, fig. 1*).—By spectrographic and biological tests the synthesis of vitamin D in ergosterol irradiated through rat epidermis was demonstrated, thus confirming the author's previous suggestions[1] that sufficient ultraviolet rays may penetrate the epidermis to activate the ergosterol contained in the capillaries just below it.

Further investigations into the fundamental nature of vitamin D action, J. P. McGOWAN (*Biochem. Jour., 27 (1933), No. 3, pp. 943–950*).—This is an extension of the investigation noted previously (E.S.R., 67, p. 345), with results confirming the preliminary findings leading to the conclusion that "vitamin D produces its action by setting free inorganic phosphate endogenously and in all probability from the lipins of the body."

Studies on vitamin G (B_2).—I, Yeast and liver preparations as a source of vitamin G (B_2), R. J. BLOCK and L. R. FARQUHAR (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 643–649*).—The substances tested for their content of vitamin G (B_2) were among those used in the treatment of pernicious anemia, including various commercial liver extracts alone and, in the case of Lilly extract No. 343, digested with human gastric juice and pig stomach, a bakers' yeast untreated and treated, and a yeast concentrate untreated and digested with human gastric juice. Dried beef liver and autolyzed and dried beef liver were also tested, and negative controls were run on the basal diet alone and supplemented with additional vitamin B_1.

The results obtained, which are expressed in terms of initial and final weights of the experimental rats on varying dosages rather than in units of the vitamin, show no simple relationship between vitamin G (B_2) and the substance effective in pernicious anemia. The liver concentrate No. 343 proved to be a good source of vitamin G, but the other extracts tested, which had a high content of the pernicious anemia factor, contained little if any vitamin G. Digestion of the liver extract No. 343 with scrapings of pig stomach or normal human gastric juice did not increase the vitamin G content. On the other hand, digestion of the yeast concentrate with human gastric juice and autolysis of fresh beef liver seemed to increase the growth-promoting properties of these substances.

Food-borne infections and intoxications, F. W. TANNER (*Champaign, Ill.: Twin City Ptg. Co., 1933, pp. VIII+439*).—This companion volume to The Microbiology of Foods (E.S.R., 69, p. 746) summarizes and discusses present information on food-borne infections and intoxications, as reported in the literature. Following a general introduction to the subject and a chapter on food hygiene, the various types of food-borne infections are discussed under the groupings of metals, plant products, animals and animal products, food allergy, *Eberthella typhi*, the *Salmonella* group, the *Proteus* group, *Mycobacterium tuberculosis*, miscellaneous organisms, putrefaction (ptomaines and ptomaine poisoning), and botulism. The relative importance of the various types of food-borne infections

[1] Biochem. Jour., 25 (1931), No. 1, pp. 57–70, figs. 7.

may be judged from the fact that the chapters on *Salmonella* group infectio[n] and on botulism, of about equal length, together make up nearly half of th[e] book.

Literature references are given throughout as footnotes.

The active principle in hog's stomach effective in pernicious anaemia J. F. Wilkinson and L. Klein (*Lancet [London], 1932, I, No. 14, pp. 719–721 fig. 1*).—A method is described for obtaining an active extract from hog stomac[h] tissue, and it is shown that the active material is unlike that from liver an[d] is probably of enzyme nature. The suggestion is made that this enzyme (fo[r] which the name hemopoietin is proposed), acting on the proteins in a norma[l] diet, may produce a substance which is stored as the active principle in live[r] until required for blood regeneration.

The relationship between the anti-anaemic principles in stomach an[d] liver, J. F. Wilkinson and L. Klein (*Lancet [London], 1933, II, No. 12, pp 629–633, fig. 1*).—Further experiments are reported confirming the views ex pressed above. The relationship between the active anti-anemic substance i[n] stomach and liver is suggested as follows:

Hemopoietin, the stomach active principle (Castle's intrinsic factor).	+	Unknown constituent of beef or gastric muscle (Castle's extrinsic factor.)	$\longrightarrow$	Liver active principle.

The superiority of the hog stomach treatment over oral liver therapy is ac counted for by the fact that the dried stomach preparation contains the enzyme the substrate, and possibly the end point of their reaction.

Investigations on the nature of haemopoietin, the anti-anaemic sub stance in hog's stomach, I, L. Klein and J. F. Wilkinson (*Biochem. Jour. 27 (1933), No. 2, pp. 600–610, fig. 1*).—Further experiments on the preparatio[n] and properties of extracts and fractions from hog's stomach containing th[e] active substance hemopoietin (addisin) are described, confirming the sugges tion that it is probably an enzyme.

Metabolic studies of children with dental caries, J. D. Boyd, C. L. Drain and G. Stearns (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 327–337*).—This report presents biochemical and dental data tending to refute the hypothesis that th[e] susceptibility of the tooth to decay is determined by the acid-base equilibrium and the levels of calcium and phosphorus in the blood stream and saliva. Th[e] subjects on whom dental examinations and metabolic studies were made range[d] in age from 3 to 20 years and varied widely in physical condition, some bein[g] without apparent disease and others under treatment for different types o[f] chronic ailment.

Observations on the serum calcium and inorganic phosphorus of 26 childre[n] with no cavities or caries, 32 with inactive caries, and 44 with active carie[s] showed no correlation between the concentration of these two constituents o[f] the blood serum and the condition of the teeth. Similar data for the salivar[y] calcium and phosphorus content of a smaller number of children likewis[e] showed no correlation with the condition of the teeth.

Calcium, phosphorus, and nitrogen retentions of 28 children with no dental caries, 32 with inactive, and 38 with active caries and of 7 subjects durin[g] periods of active and inactive caries showed a definite correlation between th[e] degree of retention of calcium and phosphorus (but not of nitrogen) and the freedom of teeth from decay.

A final tabulation of bloom serum values and dental findings in a small group of subjects with profound chronic disturbances of mineral metabolism showed no tendency toward increased incidence of caries, although there wa[s] striking destruction of the bony supporting structures of the teeth.

"The studies here reported offer no evidence that dietary deficiency of phosphorus is an outstanding factor in the incidence of dental caries, or that degrees of acid-base imbalance induced by any ordinary diet can be held responsible. They indicate that a close correlation exists between the metabolic efficiency of the organism as a whole and the resistance of the tooth to decay. They offer evidence that resistance to decay is dependent primarily upon factors operating from within the tooth. Furthermore, the data suggest that optimum retentions of calcium and of phosphorus may be higher than those usually accepted as adequate."

Serum lipid changes and therapeutic effects of various oils in infantile eczema, A. E. Hansen (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 2, pp. 160, 161, fig. 1*).—Additional data have confirmed earlier findings (E.S.R., 70, p. 274) of an abnormally low iodine number of the serum fatty acids of infants suffering from eczema. The average iodine number in 21 determinations on 11 infants suffering from eczema was 82 and in the same number of determinations on the same number of normal infants in the same age group 114. The magnitude of difference between these two groups was similar to that between rats suffering from unsaturated fatty acid deficiency and normal rats.

In all, 14 infants suffering with severe eczema have been treated by the author with good clinical results by the administration of oils especially rich in unsaturated fatty acids. Changes in the iodine numbers of the serum fatty acids of 3 of these infants who were kept under close observation over a period of months while receiving the treatment, together with similar data for a control receiving no treatment, are shown graphically. In all 4 cases the iodine numbers were low before treatment, and in the one subject receiving no treatment the values fell still lower during the period of observation in which there were no definite signs of clinical improvement. In the other subjects who were given linseed oil or corn oil, the iodine numbers of the serum fatty acids returned to normal levels coincidently with marked clinical improvement.

The effect of heating egg white on certain characteristic pellagra-like manifestations produced in rats by its dietary use, H. T. Parsons and E. Kelly (*Amer. Jour. Physiol., 104 (1933), No. 1, pp. 150–164, figs. 3*).—In continuation of the investigation noted previously (E.S.R., 65, p. 489), the authors have studied the effects of heating Chinese dried egg white, moist fresh and storage egg white, and laboratory-dried egg white on their respective dermatitis-producing properties. The same procedure was followed as in the earlier studies.

It was found that the drying process in itself is not responsible for the striking injurious effects of Chinese dried egg white, for the same effects were produced with fresh undried egg white. The injury did not occur when egg white in any form had been given sufficient heat treatment. "A temperature of 67°, which produces a jellylike texture in egg white typical of many egg dishes commonly used in human dietaries is not, however, sufficient, even when continued for 1 hr., to completely detoxify any of these four types of egg white mentioned above. Some even higher temperatures held for a short time are insufficient. Egg white from fresh or cold storage eggs, heated either at once or after being dried in the laboratory and moistened again, is almost entirely detoxified by a temperature of 80° maintained for 5 min."

The character of the dermatitis-producing factor in dietary egg white as shown by certain chemical treatments, H. T. Parsons and E. Kelly (*Jour. Biol. Chem., 100 (1933), No. 3, pp. 645–652*).—This paper reports a further study of the nature of the injurious factor in egg white and the conditions favoring its destruction. The plan followed consisted in producing the characteristic

pellagra-like lesions in young rats on the basal Ration B containing 66 percent of untreated egg white and then attempting to cure it by substituting a treated sample of egg white for the untreated, or adding it to one of the rations for a 30-day period.

Incubation of hydrated Chinese dried egg white for 3 days with 1.6 cc of N HCl per gram of the dried egg white detoxified it to such an extent that the treated material cured the pellagra-like condition in 30 days. This cure was shown not to be the result of the acid itself, although the pH of the solution during digestion was an important factor. Peptic digestion of the egg white was also effective. That denaturation was not the essential change involved was demonstrated by the persistence of toxicity in egg white denatured by strong alcohol and leached in running water for 50 hours. Mild treatment with nitrous acid and with formaldehyde did not change the toxicity. The protein fraction of egg white precipitated by complete saturation with $(NH_4)_2SO_4$ was distinctly toxic in a concentration of 30 percent, but the dialyzed filtrate from the precipitation was not toxic. Purified egg albumin was not toxic.

An experimental study of a so-called "pellagra-producing" diet, T. D. Spies and J. Grant (*Amer. Jour. Physiol., 104 (1933), No. 1, pp. 18–22, figs. 4*).—Ventriculin (desiccated hog stomach) has been shown to have curative properties for the pellagra-like lesions in rats on a diet of corn meal, pork fat, sirup, polished rice, cornstarch pudding, and sugar.

TEXTILES AND CLOTHING

Textiles and the microscope, E. R. Schwarz (*New York and London: McGraw-Hill Book Co., 1934, pp. XI+329, figs. [285]*).—The present work attempts to place the results of the author's experience in the application of microscopy to textile research in concise and usable form. Successive chapters deal with microscopes for textile research, manipulation of and illumination for the microscope, accessory equipment, micrometry, specimen mounting, preparation of cross sections, recording data, photomicrographic apparatus and technic, stereoscopic photomicrography, polarized light and its applications, and analysis of fabrics, yarns, and fibers. Qualitative and quantitative comparisons and photomicrographs of sections of certain common fibers are appended, together with lists of reagents and other information and a comprehensive bibliography and an index.

Quality guides in buying sheets and pillowcases, R. O'Brien (*U.S. Dept. Agr. Leaflet 103 (1934), pp. 8, figs. 3*).—In this leaflet, which has been prepared as an aid to the housewife in the selection of sheets and pillowcases, the characteristics of a good sheet are described in terms of fiber or "staple", thread count, tensile strength, regularity in weaving, sizing, weight, appearance of hems, and length and width for beds of different sizes. For pillowcases the same quality tests hold. Information is given on suitable sizes for pillows of different dimensions. As a further purchasing aid, Federal specifications are given for cotton bleached sheets and pillowcases. It is noted, however, that Government specifications are minimum only and will not necessarily be satisfactory to all household and institutional purchasers.

HOME MANAGEMENT AND EQUIPMENT

Planning the Willamette Valley farmhouse for family needs, M. Wilson (*Oregon Sta. Bul. 320 (1933), pp. 41, figs. 8*).—This bulletin is intended to aid designers by listing the functions of the house, describing the conditions under which the activities of the Willamette Valley farm home are pursued, and pointing out specific arrangements desirable for the conditions.

The suggestions are intended to aid home builders in insuring completeness and suitability in arrangements for their households, and in arriving at the most desirable solutions for some of their planning problems.

It is pointed out that the needs of the farm family in the valley are well served by a house having the following features: (1) A first floor consisting of kitchen, bedroom, and toilet facilities, and at least two other rooms serving the purpose of a second bedroom, main living room, supplementary living room, space for serving "company meals", sewing, farm office, and children's play room; (2) a second floor providing three bedrooms and toilet facilities, all reached directly from a center hall; (3) an "auxiliary area" for washing, for large-scale food preparation and preservation, and for the storage of products preserved at home; (4) a first-floor hall so located as to carry as much traffic as possible; (5) closed stairways between floors; (6) a front entrance located near the corner of the house facing the highway and the farm drive; (7) a back entrance near the corner facing the farm drive and farm buildings; (8) entrances adequately protected against rain; (9) provision for unloading passenger cars under cover; (10) driveway permitting bulky or heavy articles to be brought by truck to the entrance nearest the auxiliary area; (11) a lawn of the minimum size required as a setting for the house; and (12) closets for the storage of clothes, bedding, cleaning equipment, and unused furnishings.

Household refrigeration, H. B. Hull (*Chicago: Nickerson & Collins Co., 1933, 4. ed., rev. and enl., pp. 690, figs. 278*).—This is the fourth revised and enlarged edition of this book (E.S.R., 58, p. 599).

MISCELLANEOUS

Report of the director [of the New Haven Station] for the year ending October 31, 1933, W. L. Slate (*Connecticut [New Haven] Sta. Bul. 357 (1934), pp. 117–148*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the director [of the Storrs Station], 1933, W. L. Slate (*[Connecticut] Storrs Sta. Bul. 192 (1933), pp. 20*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report of the [Michigan Station], 1932 (*Michigan Sta. Rpt. 1932, pp. 161–257, figs. 31*).—The experimental work not previously reported is for the most part noted elsewhere in this issue. Vinegar analyses, by F. W. Fabian, are also included (p. 201).

Forty-sixth Annual Report of the South Carolina Experiment Station, [1933], H. W. Barre, G. H. Aull, et al. (*South Carolina Sta. Rpt. 1933, pp. 189, figs. 41*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

New Jersey Agriculture, [November–December 1933 and January–February 1934] (*N.J. Agr., 15 (1933), No. 6, pp. 8; 16 (1934), No. 1, pp. 8*).—In addition to several articles abstracted elsewhere in this issue, these numbers contain the following:

No. 6.—Location of Fertilizer Important, by W. H. Martin (p. 2), including results for 1933 of placement studies previously noted (E.S.R., 70, p. 470); and New Rye for New Jersey (p. 7) (a description of a new variety developed by the New Jersey Experiment Stations) and Annual Hay Crops (pp. 7, 8), both by H. B. Sprague.

No. 1.—Part-Time Farming, by J. G. Lipman (pp. 1, 2); Soil Erosion, by L. L. Lee (pp. 5, 6); Flaxseed, a Crop for Jersey (pp. 6, 7), and Avoiding Clover Failures (p. 7), both by H. B. Sprague; and Bacteria and Germination, by J. G. Fiske (pp. 7, 8).

NOTES

Connecticut [New Haven] Station.—During the past winter the station has supervised projects under the Federal emergency relief program which kept at work approximately 2,000 men. The largest group, about 1,500 in number, was used on mosquito elimination projects in the salt marshes, and smaller numbers were employed on European pine shoot moth, white pine blister rust, and gypsy moth control. In addition the station has been made responsible for pine shoot moth, blister rust, and gypsy moth control in most of the State Civilian Conservation Corps Camps.

Director W. L. Slate has been appointed by the Governor to the chairmanship of the State Planning Commission.

Dr. Donald F. Jones, head of the department of genetics, has been elected a member of the American Academy of Arts and Sciences.

Florida Station.—M. R. Ensign, for over 8 yr. associate horticulturist (truck crops), resigned April 1 to enter commercial work. Dr. Marvin A. Brooker, for 7 yr. assistant and associate economist, resigned May 1 to accept an appointment as chief statistician of the U.S. Farm Credit Administration, with headquarters at Columbia, S.C.

Maine University and Station.—Dr. Joseph A. Chucka, associate biologist (plant breeding and nutrition) in the station, has also been appointed head of the department of agronomy in the College of Agriculture. Beginning July 1 he will devote one half of his time to duties in the college and the remainder to station research. Delmar S. Fink has been appointed to assist him in the soils research program, effective July 1. It is planned to develop studies of fertilizers in pastures and meadows.

Dr. Frank H. Lathrop, senior entomologist in charge of the field laboratory of the U.S.D.A. Bureau of Entomology and Plant Quarantine at Whittier, Calif., has been appointed station entomologist beginning about August 1, thereby filling the vacancy caused by the death of Dr. Clarence R. Phipps (E.S.R., 69, p. 622).

Massachusetts College and Station.—Director F. J. Sievers of the station and the Graduate School has been designated by the United States Trust Company of New York to direct the investigations under the Herman Frasch Foundation for Chemical Research. Research in agricultural chemistry under this foundation is at present being supported at the University of Wisconsin, University of Missouri, and the Boyce Thompson Institute.

Pennsylvania College and Station.—Dr. Austin L. Patrick, professor of soil technology and soil technologist, has been appointed regional director of soil erosion prevention in Pennsylvania. This work is to be organized as a cooperative project of the college and the Soil Erosion Service of the U.S. Department of the Interior. The project will consist of survey, experimental, and application phases. A reconnaissance survey of the whole State will be made, also a detailed survey of scattered areas of 10 sq. miles each in different regions. This survey will determine soil types, degree of slope, and nature of cover governing the type and the degree of erosion. Experiments on methods of controlling losses of water and surface soil will be conducted on the college farms.

EXPERIMENT STATION RECORD

Vol. 71 August 1934 No. 2

EDITORIAL

THE PRESERVATION OF ROTHAMSTED

Exactly a century has now elapsed since Sir John Lawes entered into the possession of the estate at Rothamsted which under his leadership became known the world over for its unique contribution to agricultural research. As early as 1837 he was carrying on experiments in pots on the effect of various manures, including phosphates treated with sulfuric acid, and field trials on the estate in 1840 and 1841 played their distinctive part in developing a fertilizer manufacture which did much to revolutionize farm practice. The foundation of the Rothamsted Experimental Station and the association of Dr. J. H. Gilbert with the new enterprise took place in 1843, and the main experimental plats there date from the year 1850.

In the words of a recent article in *The Journal of the Ministry of Agriculture* of Great Britain, " agricultural experiments are necessarily anchored to the land." One of the outstanding distinctions of the Rothamsted work has been " the fact that its field experiments go on continuously year after year and that very full field records are taken. No other agricultural experiment station has been able to continue its field work so long and so systematically, and hence no other station can boast the wealth of field records that Rothamsted possesses and to which it is continually adding."

This element of continuity has been so generally accepted as synonymous with Rothamsted and its work that reports received some months ago of the possibility that its experimental fields might shortly be rendered unavailable were very unexpected as well as deeply disquieting. It appeared that when Sir John Lawes set up in 1889 the Lawes Agricultural Trust which controls the station and granted to its use for 99 years the experimental fields then available, this by no means included the entire estate, and made little provision for extensions as the work developed. Through the courtesy of the heirs in whom title has been vested since Sir John's death, many supplementary facilities have been placed at its disposal but on a short-term basis. With the passing of the years came other

changes, so that the leases and agreements no longer afforded "a prospect of the peaceful continuity essential for agricultural experiments." Recently some of the estate has been zoned for building purposes, and the purchase of the property by outside interests has been sought. As a result the future of the entire station enterprise was seriously jeopardized.

Under these circumstances an option was obtained by the trust, expiring on May 12, 1934, for its acquisition of the entire estate, including the manor house erected in 1470, for the sum of approximately £35,000. Unfortunately the trust itself had no accumulated funds, the entire income from its endowment of £100,000 going to the maintenance of the work, and the Development Fund set up by the British Government some years ago was likewise unavailable. Public appeal was therefore made for contributions by a committee headed by the Duke of Devonshire, chairman for the Society for the Extension of the Rothamsted Experiments.

Widespread interest was manifested in Great Britain as the situation became realized, and the response was immediate and unmistakable. Within 7 weeks pledges for the full amount necessary were in hand. The subscriptions included £15,000 from Mr. Robert McDougall, well known in British milling circles, £5,000 from the Sir Halley Stewart Trust, and £2,000 from the Carnegie United Kingdom Trust, while the remainder came from about 450 farmers and their societies and others interested in agriculture.

The purchase of the estate places in the ownership of the station 527 acres of land. This is considerably more than has hitherto been occupied and is deemed sufficient to allow of any anticipated expansion of work for a long time to come. A letter recently received from Sir John Russell, director of the station, concludes with these words, "I am happy to say that the situation is now completely safeguarded and that the Rothamsted fields are saved for all time."

This outcome is of course deeply gratifying and will be received with much satisfaction by all to whom the name of Rothamsted is known. Its effect is to establish this historic enterprise on a more substantial footing than ever before, and to provide not only permanence but enlarged facilities for its continuance and development under exceptionally favorable conditions.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the Indiana Station] (*Indiana Sta. Rpt. 1933, pp. 45, 46*).—Data are reported as to the conditions required for the preservation of the sucrose hydrolyzing enzymes of tomato leaves, methods for determining carbohydrates in plants, the effect of storage of samples of plant material in alcohol on the sugar content, and methods for the determination of insoluble phosphoric acid in fertilizers.

The proteins of grasses.—II, A new method of preparation, A. C. CHIBNALL, E. J. MILLER, D. H. HALL, and R. G. WESTALL (*Biochem. Jour., 27 (1933), No. 6, pp. 1879–1884*).—The ether-water method of preparing proteins from leaves (E.S.R., 68, p. 720) was modified in such a manner as to give excellent yields of the protein of several pure strain grasses and of certain forage crops. "The essential point is that the ether water must have been used at least once before to cytolyze an appropriate amount of leaf material. This extraordinary difference in action between 'fresh' and 'used' ether water is discussed in some detail."

The hydrolysis of caseinogen by pepsin and by trypsin-kinase, J. D. STIRLING and G. M. WISHART (*Biochem. Jour., 26 (1932), No. 6, pp. 1989–1999, figs. 8*).—The action of trypsin-kinase and pepsin on the caseinogen molecule resulted in products not completely soluble in trichloroacetic acid. With pepsin the rate of liberation of acid-soluble nitrogen was greater than that of acid-soluble phosphorus, while with trypsin-kinase the opposite relation was observed.

These results are explained on the assumption of a caseinogen molecule in which all the phosphorus is concentrated in one comparatively small group. The trypsin-kinase is considered to act on a peptide linkage in proximity to the phosphorus atoms, thus confining all the phosphorus to the cleavage product of lower molecular weight; the pepsin, on a peptide linkage distant from the phosphorus atoms, giving rise to a phosphorus-containing substance of high molecular weight.

The use of pure phosphotungstic acids in the precipitation of bases.—I, Method of checking the purity of 1:24-phosphotungstic acid. II, The influence of hydrion concentration and some other factors on the precipitation of bases, H. BARNES and R. A. PETERS (*Biochem. Jour., 26 (1932), No. 6, pp. 2203–2219, figs. 5*).—Of these two papers the first presents data showing that the purity of phospho-24-tungstic acid can be determined (1) from its loss of 63 M of water from each molecule of the acid at 540° C. and (2) from the nonvolatility of 24 M of tungsten trioxide on ignition of the acid at 1,000°.

In the work recorded in paper 2 the precipitation of creatinine and of histidine HCl by pure phosphotungstic acids was studied in detail, and some data concerning the precipitation of certain other bases were obtained. "The dissociation curves of the acids have also been investigated, and the data

considered to some extent theoretically, but especially in their practical bearing upon newer methods of separating bases by the sodium phosphotungstate technic."

Note on the oxidation of tyrosine, tyramine, and phenylalanine with hydrogen peroxide, H. S. RAPER (*Biochem. Jour., 26 (1932), No. 6, pp. 2000–2004.*)—Seeking a possible explanation of the formation of 3,4-dihydroxphenylalanine in certain plants and insects and of 3,4-dihydroxyphenylethylamine in *Sarothamnus scoparius*, together with tyramine, the author investigated the action of hydrogen peroxide in dilute solutions of phenylalanine and of tyrosine, finding that in the presence of ferrous sulfate as a catalyst phenylalanine yielded tyrosine, *l*-tyrosine yielded *l*-3,4-dihydroxyphenylalanine, and tyramine gave 3,4-dihydroxyphenylethylamine. In addition to their indication of a possible explanation of the origin in biological systems of the catechol derivatives in question, the results cited are considered to "add a few examples to the many which already exist of the probable importance of hydrogen peroxide as an oxidizing agent in living organisms."

The isolation of amino-acids in the form of the corresponding carbamido-acids and hydantoins.—I, The derivatives of the mono-amino-monocarboxylic acids, W. J. BOYD (*Biochem. Jour., 27 (1933), No. 6, pp. 1838–1848*).—"It does not appear . . . that anyone has converted protein hydrolysates as a whole into the carbamido acids or hydantoins with a view to the separation of the derivatives of the various amino acids. In this preliminary paper experiments are described which show that it is easy to isolate a number of amino acids from protein hydrolysates as the corresponding carbamido acids in yields similar to those obtained by other methods. The method is applicable to relatively small samples of protein, 25 g being a suitable quantity. . . .

"Whether it be considered by itself, or in conjunction with previously existing methods of protein analysis, the carbamido method shows promise of considerable utility. It should prevent the possibility of mixtures of commonly occurring amino acids being mistaken for hitherto unknown substances. Mixtures of leucine, isoleucine, and valine, of tyrosine and cystine, and of glycine and alanine have been found difficult to resolve. The methods described or indicated here provide solutions of these problems. The use of urea instead of potassium cyanate in conjunction with these methods of separation provides a cheap process for the preparation of certain amino acids in the pure condition. The hydrolysis of the hydantoins, however, yields only racemic amino acids."

A preliminary note on a prolamin isolated from a legume seed, A. HASSAN and M. K. A. BASHA (*Biochem. Jour., 26 (1932), No. 6, pp. 1843–1845*).—The authors extracted the protein soluble in hot 70 percent alcohol from the dried, ground, and ether-extracted seed of the legume fenugreek. The new protein precipitated from the 70 percent alcohol on cooling, and was purified by re-solution in liquid phenol and precipitation from this solvent by the addition of 96 percent alcohol to maximum precipitation followed by numerous washings with 96 percent alcohol to free the preparation completely from phenol. The phenol-free preparation was dried by washing on a Büchner funnel with absolute alcohol and with ether, followed by desiccation over calcium chloride.

There was thus obtained a tasteless and odorless amorphous white powder very slightly soluble in distilled water, more soluble in dilute hydrochloric acid, and freely soluble in dilute alkali. The biuret reaction was violet, xanthoproteic and Millon's reactions positive, tryptophan test very faint even after standing, sulfur test positive, and Molisch's reaction negative. The protein was precipitated from its dilute alkali solution by picric acid, hydroferro-

cyanic acid, by half saturation with ammonium sulfate, and by saturation with magnesium sulfate. The isoelectric point was found to lie approximately at pH 5.3, the nitrogen content was 17.18 percent, and the sulfur content 1.115 percent. The yield was from 0.2 to 0.5 percent of the weight of the ground seed.

The name "helbin" (Arabic "Helba", fenugreek) is proposed as the designation of the new protein—the first prolamine to be isolated from a legume seed.

The isolation of n-triacontanol from lucerne wax, A. C. CHIBNALL, E. F. WILLIAMS, A. L. LATNER, and S. H. PIPER (*Biochem. Jour., 27 (1933), No. 6, pp. 1885–1888*).—The principal component of the wax from lucern leaves was found to be a long-chain primary alcohol (m.p. 86.3°–86.5° C.), identified as *n*-triacontanol by reduction to *n*-triacontane (m.p. 65.6°–65.8°) and by oxidation to *n*-triacontanoic acid (m.p. 93.6°–93.9°). The purity of all three products was confirmed by X-ray analysis.

The wax was also found to contain mixed fatty acids and a paraffin, m.p. 65.6°, shown to be a complex mixture. Ketones were found not to be present.

The isolation of n-octacosanol from wheat wax, A. POLLARD, A. C. CHIBNALL, and S. H. PIPER (*Biochem. Jour., 27 (1933), No. 6, pp. 1889–1893*).—The principal component of the wax from blades of young wheat was found to be a long-chain primary alcohol, identified as *n*–octacosanol (m.p. 83.2°–83.4° C.) by reduction to *n*–octacosane (m.p. 61.3°–61.5°) and by oxidation to *n*–octacosanoic acid (m.p. 90.8°–91.1°). The purity of all three products was confirmed by X-ray analysis. The wax also contained mixed fatty acids and a paraffin, m.p. 66°, shown to be a complex mixture.

Observations on the decomposition of cellulose in certain Philippine forest soils, D. I. AQUINO and D. P. TABIJE (*Philippine Agr., 22 (1933), No. 5, pp. 311–321, fig. 1*).—The decomposition of cellulose in various soils under conditions including grass cultivation and cut-over of various ages was studied in residual clay loam soils containing from about 38.6 to about 46 percent of colloids and approximately 0.2 percent of nitrogen and showing a pH value of from 6.1 to nearly 6.6. The cellulose was added in the form of filter paper. Sodium nitrate was added in some of the experiments. Neither soil temperature, 27.39° to 37.65° C., nor soil moisture, 27.40 to 49.79 percent, had much effect upon cellulose decomposition. Sodium nitrate slightly increased the rate of decomposition.

The 2:4-dinitrophenylhydrazones of some ketonic acids of biological importance, F. P. CLIFT and R. P. COOK (*Biochem. Jour., 26 (1932), No. 6, pp. 1800–1803*).—Encountering a need for readily identifiable derivatives of "certain compounds [including mesoxalic acid, oxaloacetic acid, and acetoacetic acid] which were thought to be of possible biological importance", the authors prepared the 2,4-dinitrophenylhydrazones, not heretofore described, of the three ketonic acids named; and elaborated a method whereby these hydrazones could be titrated, in quantities of from 2 to 5 mg by solution in standard alkali (5 cc of 0.01 N sodium hydroxide) and determining the excess with 0.01 N acid, bromothymol blue as indicator. The intense color of the hydrazones did not mask the color change of the indicator named.

The nitrogen content as determined and the melting points of these hydrazone derivatives are recorded, and the crystalline habit of each is described.

The preparation of methyl esters of pectic acid, H. W. BUSTON and H. R. NANJI (*Biochem. Jour., 26 (1932), No. 6, pp. 2090–2096, fig. 1*).—In attempts to methylate the free carboxyl groups of pectic acid the authors prepared calcium pectate from a solution of pectin by treating it 4 hr. with dilute sodium

hydroxide, then precipitating with calcium chloride in the presence of acetic acid, and treating the resulting calcium pectate with methyl oxalate and methyl alcohol under pressure at the boiling point of water; and in a somewhat similar manner tested the reaction of silver pectate with methyl iodide and of sodium pectate with methyl sulfate.

The calcium pectate-methyl oxalate reaction gave low yields, and the sodium pectate-methyl sulfate method was considered entirely valueless. The silver pectate-methyl iodide procedure yielded approximately 47 percent of the theoretically obtainable quantity of the required ester.

"Pectic acid is readily converted into its methyl esters by heating silver pectate with methyl iodide under slight pressure. The products resemble the natural soluble pectins in all respects. There is no reason to suppose that the soluble pectins are other than simple methyl esters of pectic acid.

"The ethyl esters of pectic acid are apparently unstable, undergoing extensive decomposition under the experimental conditions used in their preparation."

The specific rotation and stability of (2,5)-fructose from a mathematical study of the hydrolysis of sucrose by fructosaccharase, K. BAILEY and R. H. HOPKINS (*Biochem. Jour., 27 (1933), No. 6, pp. 1957–1964, figs. 2*).—This paper "concerns the use of yeast fructosaccharase as an agent in the elucidation of the specific rotation of (2,5)-fructose as liberated from sucrose, and of the unimolecular velocity constant of the change of (2,5)-fructose to equilibrium fructose." The specific rotation (17° C., pH 4.6–6.1) of (2,5)-fructose was found to be between +17° and +15°. The change of fructofuranose to equilibrated fructose was shown to conform to a unimolecular law. The unimolecular velocity constant $k^{(mins.^{-1})}_{F\ 17^\circ}$ was found to be 0.3.

The oxidation of fructose by hypoiodite, K. BAILEY and R. H. HOPKINS (*Biochem. Jour., 27 (1933), No. 6, pp. 1965–1974*).—The rate of oxidation of fructose by hypoiodite under the conditions of the Willstätter and Schudel method (E.S.R., 40, p. 312) for the estimation of aldoses increased with temperature to the point at which oxidation ceased. The extent of oxidation at this point, between the temperatures 1° and 35° C., reached a minimum at 15°. In presence of excess alkali, enolization of the fructose occurred between 17° and 37°, rendering it capable of oxidation by iodate. "The oxidation thus becomes a progressive reaction which has no limit. At 1° enolization is not induced, and oxidation rapidly reaches a limit lower than that obtained by the use of only a slight alkali excess."

A four to fivefold increase in the oxidation of fructose by hypoiodite was obtained by adding the necessary alkali in small increments at definite time intervals. The extent of the oxidation appeared to be an inverse function of the rate of alkali addition. "Under specified conditions, the oxidation of fructose (using the iodine value 1.41 as for glucose) may exceed 100 percent, on the basis of one atom of oxygen per molecule oxidized." The percentage oxidation under arbitrary conditions of oxidation did not vary greatly with the fructose concentration. The products of oxidation were oxalic and, presumably, *d*-erythronic acids. A consideration of the factors influencing the kinetics of the oxidation of fructose by hypoiodite led to the hypothesis that only one component undergoes oxidation.

The relation of thiol compounds to glucose fermentation, J. H. QUASTEL and A. H. M. WHEATLEY (*Biochem. Jour., 26 (1932), No. 6, pp. 2169–2176*).—Iodoacetic acid was found to react with sodium thiosulfate, with cysteine, and with glutathione, these substances lessening the toxic action of the acid.

Further, "cysteine and glutathione markedly affect the relationship between fermentation and respiration of baker's yeast in the presence of glucose. Cysteine inhibits the oxygen uptake of baker's yeast in the presence of glucose; glutathione has but little effect. Both thiol compounds increase the rate of CO_2 formation, glutathione having the greater action. The fermentation of fructose is affected in a similar manner to that of glucose by cysteine. The O_2 uptake and CO_2 output of yeast in presence of glycerol are only slightly affected by cysteine. The controlling action of glutathione on aerobic fermentation is probably of significance in the normal metabolism of the cell."

The oxidase system of a non-browning yellow peach, Z. I. Kertesz (*New York State Sta. Tech. Bul. 219 (1933), pp. 14*).—The results of the investigation here reported showed that neither the juice nor the exposed flesh of peaches of the variety Sunbeam darkened more than very slightly on contact with air; that this immunity of the variety in question from browning was not due to a low concentration or absence of oxidizing enzymes, since the enzymic extract from the fruit readily caused browning of the catechol-tannin material extracted from peach varieties subject to browning; and that the variety in question probably owes its immunity from browning to the very low concentration, apparently the total absence, of the catechol-tannin type of compound. The last named characteristic of the Sunbeam variety was established both by qualitative and by quantitative determinations.

The heat-inactivation of crystalline pepsin: The critical increment of the process, W. J. Loughlin (*Biochem. Jour., 27 (1933), No. 6, pp. 1779–1788, figs. 3*).—The heat inactivation of a crystalline preparation of pepsin was found to follow the theoretical course of unimolecular reaction. At a given temperature the rate of heat inactivation varied with the pH, being at a minimum in the pH range, 3 to 4.5, and increasing rapidly when the pH was carried outside this range. The effect of temperature on the rate of heat inactivation was found very marked; the critical increment of the process being of the order 80,000 calories, but varying with the pH. It reached a maximum (96,000 calories) in the pH range in which the rate of inactivation reached its minimum. The critical increment decreased to a much lower value (70,000 calories) in the more acid and alkaline regions (pH 2.3 and 6.0).

It is shown that the heat inactivation of enzymes and the heat denaturation of proteins "are analogous, in all but one point, viz, the location of the minimum speed, for which no explanation can be offered at present."

A substance inhibiting bacterial growth, produced by certain strains of lactic streptococci, H. R. Whitehead (*Biochem. Jour., 27 (1933), No. 6, pp. 1793–1800*).—Two strains of lactic streptococci which produce during their growth substances having a marked inhibitory action on the growth of other lactic acid bacteria are described. Evidence that the inhibitory substances are of protein nature, possibly polypeptides, soluble in absolute alcohol and hydrolyzable by trypsin and alkali, but stable toward pepsin, is presented.

The significance of the properties of the organisms is discussed from the points of view both of the classification of the streptococci and of technical processes, with particular reference to such processes as cheese manufacture, in which lactic acid bacteria are used for the production of acid.

The chemistry of mould tissue, I, II (*Biochem. Jour., 26 (1932), No. 6, pp. 1934–1945, fig. 1; 1946–1953, fig. 1*).—These two papers open a serial contribution from the University of Wisconsin.

I. *Soluble carbohydrate constituents,* A. G. Norman, W. H. Peterson, and R. C. Houtz.—When the organism was grown on a glucose-ammonium nitrate medium *Aspergillus fischeri* yielded as the sugar units of its carbohydrate content only glucose and a trace of a pentose.

The chief water-soluble carbohydrate was precipitated by acid alcohol. It gave no color with iodine, was readily hydrolyzed by boiling with 3 percent H_2SO_4, and passed slowly through a cellophane membrane. It had a rotation of $[\alpha]_D^{22°} = +86.2°$. Glucose only was obtained on hydrolysis.

Alkali-soluble preparations containing a high percentage of protein were obtained by extraction with alkali and precipitation with acid. These could not be purified by copper precipitation, enzymic digestion, or fractional acid precipitation. By precipitation with alcohol from alkaline solution a carbohydrate of low nitrogen content was obtained. It gave an intense blue color with iodine, and had a specific rotation of +85.1°. The residual nitrogen was present as protein, not as hexosamine. Taka-diastase, malt diastase, etc., liberated reducing sugar. An interrupted hydrolysis indicated the presence of two types of sugar linkage, one easily hydrolyzed, the other more resistant. Glucose only was obtained on hydrolysis. The filtrate from the preparation of this alkali-soluble fraction yielded on acidification precipitates containing about 66 percent protein, the remainder carbohydrate.

II. *The resistant cell-wall material*, A. G. Norman and W. H. Peterson.—After exhaustive alkaline treatment of the tissue of *A. fischeri*, about 20 percent of a resistant cell-wall material remained. The preparations yielded hexosamine hydrochloride on hydrolysis with HCl and had a nitrogen content of about 3 percent. This indicated the presence of approximately 35 percent anhydrohexosamine in the complex. The material was insoluble in cellulose solvents, but gave a xanthate. Only a trace of a soluble acetylated derivative was obtained: the insoluble product of acetylation contained 10.7 percent acetyl. Acetolysis resulted in charring and decomposition. Hydrolysis could be effected readily after solution in concentrated H_2SO_4, but the maximum recovery of apparent glucose was only 72 percent. Dilute acid liberated both glucose and hexosamine slowly, and under pressure more rapidly. Glucose units were liberated more rapidly than hexosamine in the opening stages, and a residue containing about 50 percent anhydrohexosamine was consistently obtained unless the treatment was very vigorous. Acetic acid was obtained on acid hydrolysis in amount approximating one CH_3CO group for every hexosamine unit.

Fermentation with active cultures of thermophilic cellulose-decomposing organisms was slight, 10 percent only being lost in 3 weeks.

"The evidence suggests that cellulose, in the form usually met with in plants, is absent from this complex, which is probably a mixture of two components, one containing hexosamine, glucose, and acetyl units, and the other, more readily hydrolyzed, glucose units alone."

Studies in the biochemistry of micro-organisms.—XXXV, The metabolic products of Byssochlamys fulva Olliver and Smith, H. Raistrick and G. Smith (*Biochem. Jour., 27 (1933), No. 6, pp. 1814–1819*).—This fungus, causing spoilage of canned fruits, was grown on Czapek-Dox solution with 5 percent glucose, at 24° C., until all the sugar was consumed. Approximately 30 percent of the glucose was converted to mannitol and 0.5 percent to a new mold product, byssochlamic acid, $C_{18}H_{20}O_6$. This acid was found to be insoluble in water, to melt at 163.5°, to have $[\alpha]_{5461}^{20°}$ +127°, $[\alpha]_{5790}^{20°}$ +108° in chloroform solution, and to titrate as a tetrabasic acid with the addition of 2 molecules of water. The sodium salt showed a definite, though low, toxicity to mice. Above 24° growth was more rapid, but less byssochlamic acid was found to be produced.

Some new antiseptics related to indan-1:3-dione, F. A. Robinson, A. J. Suthers, and T. K. Walker (*Biochem. Jour., 26 (1932), No. 6, pp. 1890–1901*).—The authors synthesized 17 alkyl-4-hydroxyindan-1:3-diones by the condensa-

tion of mono-*n*-alkylmalonyl chlorides with *p*-*n*-alkyl derivatives of phenol and with 3-*n*-amyl-*p*-cresol, in the presence of aluminum chloride, and showed the antiseptic activity of these compounds to be highly selective. "In very low concentrations they inhibit the proliferation of Gram-positive bacilli and cocci, as shown by tests against *Bac[illus] megatherium, B. subtilis, B. mycoides, S[taphylicoccus] albus*, and *S. aureus*. At higher concentrations the substances exercise lethal action on all these organisms. The acid-fast organism *Mycobact[erium] phlei* is particularly sensitive to the presence of certain of them; thus one strain, in broth (pH 6.1), is killed within 24 hr. at 37° [C.] when 4-hydroxy-2:7-di-*n*-hexylindan-1:3-dione is present at a concentration of 1:20,000,000. Another strain of the same organism is killed under the same conditions when the same compound is present at a concentration of 1:11,110,000.

"On the other hand, these compounds have little or no adverse action on the proliferation, in broth, of the Gram-negative organisms *Bact[erium] coli, B. pyocyaneum*, and *B. prodigiosum*.

"The antiseptic activities of the new substances are depressed considerably by culture media which are slightly alkaline in reaction, and are suppressed entirely by ox serum."

Irradiated adenine sulfate and the antineuritic vitamin B_1 [trans. title], F. SCHULTZ and F. LAQUER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *219* (*1933*), *No. 3–4, pp. 158–163*).—Unsuccessful attempts to synthesize vitamin B_1 by irradiation of adenine, adenine chloride, or adenine sulfate are reported and discussed, with the conclusion that the success reported by Guha and Chakravorty (E.S.R., 68, p. 725) was due to faulty technic. The possibility is suggested that Guha and Chakravorty were observing the effects of vitamin B_4, which, according to Tschesche (E.S.R., 71, p. 7), is either adenine itself or exists as an impurity on adenine crystals.

Vitamin C in citrus juices, A. H. BENNETT and D. J. TARBERT (*Biochem. Jour.*, *27* (*1933*), *No. 4, pp. 1294–1301*).—In this investigation, which was carried on at Messina, Sicilia (Sicily), the Tillmans titration method with dichlorophenolindophenol was applied to the examination of lemon and orange juices under varying conditions of storage. The procedure, which was carried out in slightly acid solution, is described in detail. The data obtained are given in cubic centimeters of N/1,000 solution of the indicator per cubic centimeter of juice and are not recalculated to ascorbic acid.

The values for 21 samples of freshly squeezed and strained lemon juice showed wide variations, with a range of from 6.25 to 10.7 cc N/1,000 indicator per cubic centimeter of juice. No relation could be established between the reducing value of the juice, its acidity, or its ripeness. Orange juices gave more uniform and higher values, ranging from 10.3 to 11.8.

The addition of preservatives capable of preventing fermentation was followed by a gradual disappearance of reducing power, complete within a few weeks. When the juices were stored without preservatives there was no change in reducing power, even if the solution fermented and molded. Juices preserved with sulfur dioxide retained their reducing power longer than the others, but not longer than 30 or 40 days. Rapid loss of reducing power resulted from the addition of alcohol to the juice or its acidification. Traces of iron and aluminum were without effect, but copper caused a rather rapid decrease until fermentation set in and then no further effect. Pasteurization, boiling, or the addition of any preservative preventing fermentation caused a loss in reducing properties. Whenever fermentation was allowed, the loss was arrested.

For purposes of comparison, titrations of commercial juices and freshly pressed juices were conducted in London by F. K. Donovan. Freshly pressed

lemon juice gave titration values of 7.7–9.45, results within the range of those obtained in Sicilia. Commercial juices preserved with SO_2 and sirups made from them gave much lower results, the highest value being 4.7. Imported lime juice preserved by its oil only gave values of 2.2 and 1.35, freshly preserved lime juice 4.85 and 4.9, imported West Indian grapefruit juice 4 and 5, and freshly pressed juice not much higher values. Sicilian grapefruit pressed shortly after gathering gave a value of 7.5, comparable with that of lemon juice. "It is concluded that in untreated juice the reducing factor is protected from atmospheric oxidation by the action of an enzyme, and that when this action is inhibited by any of the usual means the reducing power is rapidly lost."

The regeneration of the reducing properties of oxidised lemon juice, S. W. Johnson (*Biochem. Jour., 27 (1933), No. 4, pp. 1287–1289*).—Using certain precautions which are outlined, the author has been able to confirm the observations of Tillmans and his associates (E.S.R., 69, p. 8) that the reducing capacity of lemon juice destroyed by oxidation with indophenol, iodine, or hydrogen peroxide can be restored by treatment with hydrogen sulfide immediately after oxidation.

Free fatty acids in cod-liver oil and vitamin D [trans. title], O. Schultz (*Ztschr. Vitaminforsch., 1 (1932), No. 4, pp. 287–289; Eng. abs., p. 288; Fr. abs., pp. 288, 289*).—The possible destructive effect of free fatty acids on the vitamin D content of cod-liver oil was tested by determining four times during a period of 2 yr. the vitamin D content of six samples of oil varying in content of free fatty acids from 1 to 20 percent.

All of the samples had lost about 30 percent of their activity at the end of the experimental period, no differences being detectable between samples of high and low fatty acid content. The author concludes that manufacturing methods, with the exception of bleaching, have no effect upon the vitamin D content of cod-liver oil.

A new micro-quinhydrone electrode, T. Mikawa (*Biochem. Jour., 27 (1933), No. 6, pp. 1829–1831, fig. 1*).—A minute drop of the fluid under examination is mixed with fine quinhydrone powder and is sucked into a fine gold tube, which serves as the metal electrode. The pH of the fluid is measured by the ordinary potentiometric method. The outer surface, and also preferably both ends of the inner surface of the tube, as well as the leading wire, should be so insulated that they do not come into electrical contact with any part of the fluid which is not saturated with quinhydrone. The inner electrode surface must be gilded perfectly. A drawing shows the form in which the apparatus was used by its adviser, who found 0.01 cc to be sufficient for a pH measurement.

Standardised collodion membranes in low pressure ultrafiltration, S. J. Folley (*Biochem. Jour., 27 (1933), No. 6, pp. 1775–1778, figs. 4*).—The author describes a method for producing collodion tube ultrafilters of reproducible permeability and capable of being used at pressures as low as 120 mm mercury. Contact of the material to be filtered with either metallic surfaces or rubber-fiber gaskets is avoided. Filters impermeable to proteins, and filters capable of passing proteins, were both readily formed by the method described. Diagrammatic drawings indicate the nature of the set-up used.

The advantage, in dealing with biological fluids, of avoiding very high pressures in ultrafiltration is emphasized.

The cryoscopic method for the determination of "bound water," R. A. and W. A. Gortner (*Jour. Gen. Physiol., 17 (1934), No. 3, pp. 327–339, figs. 4*).—The authors of this contribution from the Minnesota Experiment Station propose a new method of calculating the true freezing point of a solution. Gum

acacia in aqueous sucrose solutions showed positive values for bound water, the figures amounting to 0.6 to 0.7 g of bound water per gram of the gum. Gum acacia in aqueous solutions of KCl and KBr showed slightly negative values for bound water, this result indicating a preferential adsorption of the solute rather than the solvent.

A titration method for determining the total and exchangeable bases in soils, S. Parameswara Aiyar (*Indian Jour. Agr. Sci., 2 (1932), No. 3, pp. 225–241*).—The author proposes leaching with approximately 0.05 N hydrochloric acid, followed by titration of the acidity and total chloride content of the extract, the difference between these titrations being taken as corresponding to the chlorides of calcium, magnesium, potassium, and sodium. Correction for bases present as carbonates is to be made on the basis of a carbon dioxide determination.

Various indicators were shown to be suitable for the titration, and conditions believed to permit the accurate alkalimetric titration of the chlorides of iron, aluminum, and manganese were determined.

A migration method for the determination of replaceable bases in soils, L. C. Wheeting (*Soil Sci., 37 (1934), No. 4, pp. 243–252, fig. 1*).—A contribution from the Washington Experiment Station describes a new electrical method and reports upon its experimental results as compared with those of barium chloride and ammonium acetate replacement methods.

In the migration method the soil sample (10 g air-dried) is left in contact for about 1 hr. with 10 cc of normal ammonium acetate solution, which is added slowly and hot. The soil is transferred, by means of a quantity of 2 percent solution of agar in normal ammonium acetate solution sufficient to form not more than an 8-cm column, into a tube 2.5 cm in diameter and 45 cm in length, previously prepared with a 25 cm column of 2 percent agar in normal ammonium acetate solution. After the soil-agar plug has cooled, the remaining 12 cm of the length of the tube is filled with 2 percent agar containing 0.5 N cobalt acetate. The desired migration is brought about by passing a current of about 0.5 to 0.6 a (voltage of about 110) between a platinum anode in normal cobalt acetate in contact with the cobalt salt agar and a copper cathode in normal copper acetate solution, which is in contact with the ammonium acetate agar end of the tube until cobalt makes its appearance in the ammonium acetate agar. The soil cations are then determined in the ammonium acetate agar column, and correction is made for the previously determined calcium, magnesium, potassium, and sodium contents of the agar used.

"Since the migration method does not appreciably change the pH value of the soil during extraction, or bring about excessive solubilities through leaching, it seems to do away with the worst features of other methods, including electrodialysis.

"The results of the migration method show that the present ideas, based upon leaching methods and others, regarding the ratios of replaceable bases in soils must be revised. There is generally more sodium and magnesium in replaceable form in the soils than has formerly been obtained through the use of the usual methods of extraction. . . . Use of the migration method may probably be made in connection with anion studies in soils and in the extraction of mineral constituents from plant tissues."

The micro-determination of phosphorus as phosphomolybdate, R. H. A. Plimmer (*Biochem. Jour., 27 (1933), No. 6, pp. 1810–1813*).—The accurate estimation of microquantities of from 0.01 to 0.1 mg of phosphorus by the molybdate method was found to depend upon (1) the presence at the time of precipitation of 20 cc of 10 percent ammonium nitrate solution for every cubic centimeter of

concentrated H_2SO_4; (2) the use of a purified solution of ammonium molybdate; and (3) the filtration of the precipitate on a suitably formed asbestos filter.

The colorimetric determination of phosphorus in the presence of interfering substances, D. R. and W. C. DAVIES (*Biochem. Jour., 26 (1932), No. 6, pp. 2046–2055, fig. 1*).—Pyrophosphoric, glycerophosphoric, citric, oxalic, pyruvic, tartaric, malic, lactic, and glycolic acids were shown to interfere with the quantitative determination of orthophosphate by the colorimetric method, and the maximum quantities of the interfering compounds which would permit theoretical recovery of orthophosphate were determined.

Complex formation between ammonium molybdate and the interfering substance and hydrolysis of pyrophosphoric and glycerophosphoric acids producing orthophosphoric acid caused the difficulties. By increasing the amount of molybdate, within certain limits, it was possible to estimate orthophosphate in the presence of larger amounts of the foreign substance than were tolerable in the regular form of the method.

The iodimetric titration of cysteine and allied substances, C. C. LUCAS and E. J. KING (*Biochem. Jour., 26 (1932), No. 6, pp. 2076–2089, figs. 5*).—"Temperature exerts a marked effect on the amount of iodine combined by cysteine in solution. Extraordinary differences are found in the amounts of iodine consumed at different H-ion concentrations. Esterification of the carboxyl group lessens the temperature effect and almost eliminates the cH effect. Acetylation of the amino group, on the other hand, increases the maximum of iodine consumption and alters its position on the pH curve. The concentration of cysteine in the solution titrated and the concentration of the iodine used have a marked effect on the extent to which oxidation occurs. In the presence of 0.5 percent potassium iodide, cysteine can be determined quantitatively by indirect iodimetric titration at 0° [C.] and N acidity."

Glutathione reduced the exact quantity of iodine indicated by the theoretical equation only at a pH value below 5 and at a temperature lower than 25°. At a high dilution there was a large error, either in the direct or in the indirect titration, which could only be eliminated by the presence of sufficient potassium iodide in the glutathione solution. The glutathione iodine reaction was much less affected by temperature, by H-ion concentration, and by dilution than was the corresponding cysteine reaction.

"The iodine consumption of ergothioneine appears to be only slightly affected by temperature, cH below neutrality, and dilution. The presence of added potassium iodide markedly diminishes the iodine consumption, particularly at acid reactions.

"Simple mercaptans may be quantitatively determined by direct titration at room temperature. On the acid side of neutrality the acidity of the medium appears to have no effect on the iodine uptake. The iodine consumption of thiol acids is markedly affected by temperature, theoretical iodine consumption only occurring at or near 0°. The influence of cH is not apparent on the acid side of neutrality."

The application of phospho-18-tungstic acid (Folin's reagent) to the colorimetric determination of cysteine, cystine, and related substances.—I, The reduction of phospho-18-tungstic acid by various substances. II, The determination of sulphydryl compounds and disulphides already existing in solution, J. W. H. LUGG (*Biochem. Jour., 26 (1932), No. 6, pp. 2144–2159, fig. 1; 2160–2165*).—These two papers report an investigation into the behavior of phosphotungstic acids under various conditions related to the colorimetric determination of cystine and cysteine and the development of a method for the determination of these amino acids in the absence and in the presence of other reducing substances.

Of the work covered in the first paper the author states, in part, that "the reduction of solutions of phospho-18-tungstic acid by different types of substances has been investigated colorimetrically under varying conditions, especially in respect to varying pH. Some attempt has been made to describe the results in general terms of reaction velocities and equilibria. Reductions by cysteine have been examined in some detail.

"Evidence has been adduced to show that the reaction between cystine and sulfites in cold aqueous solution is not a 'reduction' in the ordinary sense of the term, but that it is most probably expressed by the equation, $R-S-S-R+H_2SO_3 \rightleftharpoons RSH+RSH_2O_3$, where R-S-S-R and RSH represent cystine and cysteine, respectively."

Paper 2 fully describes a method, for the working detail of which the original must be consulted, for determining either cystine or cysteine either in pure solution or in the presence of extraneous reducing substances. A statement covering the general bases of the method is as follows:

"By estimating cysteine and cystine in acid solution all the disadvantages of alkaline color development may be avoided. The disadvantages of acid color development include slight loss in color and diminution in rate of development. For all-round utility a pH of 5.7 has been selected, and to minimize color development by extraneous reducers and for the sake of economy, only small amounts of reagent are employed. A cystine plus sulfite standard is used for comparison.

"The cysteine is allowed to develop its coloration in absence of sulfite, and its estimation in absence of extraneous reducers is quite simple. In coloration developed, 1 M of cystine = 2 M of cysteine, or 2 mg of cystine = 2.017 mg of cysteine. When extraneous reducers are present their effects must be found by artifice. In the presence of mercuric chloride cysteine gives no coloration at all, and ferrous salt is used to find the contribution of the extraneous reducers to the total coloration developed. Since $HgCl_2$ will form a precipitate with uric acid, and because it influences slightly the coloration developed by some extraneous reducers, it is necessary to have a fairly large amount of zinc chloride present to prevent precipitation and to provide an initial 'heavy metal' effect upon the weaker reducers so that the effect of the $HgCl_2$ will be diminished. To nullify the inhibiting effect of the $ZnCl_2$ upon the rate of color development by cysteine, it is desirable that some NH_4Cl be present also. The $ZnCl_2$ and NH_4Cl are incorporated with the citrate buffer used in preparing standard and unknowns.

"Cystine is estimated with sulfite present, and the estimation is simple when extraneous reducers are absent. The same buffer as is used in estimating cysteine is employed. When extraneous reducers are present, mercuric chloride and ferrous salt are used as in the corresponding cysteine estimation."

A method of determination of some biologically important aldehydes and ketones, with special reference to pyruvic acid and methylglyoxal, F. P. CLIFT and R. P. COOK (*Biochem. Jour., 26 (1932), No. 6, pp. 1788–1799*).—"The principle is similar to that described by Clausen [E.S.R., 47, p. 716] and amplified by Friedemann, Cotonio, and Shaffer [E.S.R., 58, p. 114]." In addition to their elaboration of a procedure based on this iodine titration of aldehyde-bound bisulfite, the authors developed, on the basis of the destruction by heat in alkaline solution of methylglyoxal and of certain aldehydes and ketones and the stability under like conditions of pyruvic acid and of some other ketones, a method for the analysis of mixtures containing one or more components of each of these types. They also extended the method to permit of the determination of glyceraldehyde, dihydroxyacetone, and acetal-

dehyde; investigated the interfering tendency of ethylene linkages and of sulfydryl groups, showing that, in general, compounds containing these groupings do not interfere with the determination as described; made a study of methods for the preparation of the carbonyl compounds of which the determination was to be made; and adapted the details of the bisulfite method to the recovery and estimation of pyruvic acid, methylglyoxal, acetaldehyde, glyceraldehyde, and dihydroxyacetone in the presence of muscle or liver tissue.

In a section on the behavior of β-ketonic acids and acetone it is shown that "these substances cannot be estimated with any great accuracy." Although the application of the method in these cases "may be of use in a qualitative or semiquantitative manner, the reason for the inapplicability of the method to these substances is twofold. In the first place the bisulfite compounds appear to be sufficiently unstable in acid solution to render the first end point ill defined. Secondly, a slow formation of iodoform occurs when the solutions of these substances stand in the presence of iodine and sodium bicarbonate. This renders the second end point ill defined." The acetone-bisulfite compound was found so unstable in solution that the determination could not be made. Acetoacetic acid was recoverable to the extent of from 86.5 to 89.4 percent; oxaloacetic acid, 81.8 to 90.4 percent.

A colorimetric method for the determination of glucosamine and chondrosamine, L. A. Elson and W. T. J. Morgan (*Biochem. Jour., 27 (1933), No. 6, pp. 1824–1828*).—By heating glucosamine or chondrosamine in alkaline solution with acetylacetone these substances can be converted into pyrrole derivatives which on treatment with p-dimethylaminobenzaldehyde give rise to very stable red-colored solutions. Within such limits as from about 0.5 to 3 mg of the substance to be determined, the method gave a good degree of proportionality between the hexosamine content and the color intensity.

A simple method for the determination of the melting point of fats and allied substances, M. A. Abrassi (*Biochem. Jour., 26 (1932), No. 6, pp. 1857, 1858, fig. 1*).—Essentially, an electrode of small exposed surface is coated with a thin film of the fatty or waxy substance of which the melting point is to be determined. It is then dipped into mercury which is in contact with the other electrode, the remainder of the circuit including a cell or other suitable source of current and an electric bell. A thermometer is placed in the mercury close to the film-covered electrode, and the mercury is heated slowly until, upon the melting of the film, the mercury makes contact with the electrode previously insulated by the film of sample and the bell indicates the end point of the determination.

The sample electrode was made by sealing a short bit of platinum wire into the end of a piece of 5-mm tubing about 20 cm in length, filing the protruding platinum tip flush with the surface of the sealed end of the tube, and filling the tube to a convenient height with mercury for a dipping contact. The film electrode was prepared for each use by cleaning thoroughly with a suitable solvent, drying in alcohol and ether, and dipping in a small portion of the sample material heated just to melting in a clean dry test tube.

A diagrammatic sketch shows the apparatus as used by the author.

Amyl alcohol as a source of error in the Gerber test, B. L. Herrington (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 557, 558*).—In this paper from Cornell University the author points out the possibilities of serious errors that may follow the use of the wrong kind of amyl alcohol in the Gerber test for butterfat.

The determination of bromine in blood, E. D. Yates (*Biochem. Jour., 27 (1933), No. 6, pp. 1763–1769*).—The procedure, presented in full working detail, may be summarized as follows:

Protein is first removed by precipitation with tungstic acid. An aliquot portion of the filtrate is treated with potassium hydroxide, evaporated to dryness, and heated at 500° C. for 20 min. in a nickel crucible. The extract is acidified and the bromide oxidized to bromine by a chromic-sulfuric acid mixture. This is in such concentration that, while chloride remains unoxidized, bromide oxidation is complete. The bromine is removed by aeration and absorbed in starch-iodide solution. The iodine liberated is titrated with N/1,000 sodium thiosulfate from a microburette.

Uses for the sweet potato: Sweet potato sirup, G. A. SHUEY (*Tennessee Sta. Circ. 46 (1934), pp. 4*).—Sweetpotato sirup was prepared by a method similar to that developed at the Bureau of Chemistry, U.S.D.A., by Gore in 1920 (E.S.R., 44, p. 615), but without the small addition of malt which Gore later concluded (E.S.R., 45, p. 416; 49, p. 506) would yield a better product.

The manufacture of poi from taro in Hawaii, with special emphasis upon its fermentation, O. N. and E. K. ALLEN (*Hawaii Sta. Bul. 70 (1933), pp. 32, figs. 9*).—In the first phase of the poi fermentation (produced mainly by *Lactobacillus delbrucki, L. pastorianus, L. pentoaceticus, Streptococcus lactis,* and *S. kefir*) a rapid acid production during the first 24 hr. (from about pH 6.3 to about 4.5) was observed, and was followed by slower acidification to a final figure about pH 3.8. A second phase of the fermentation, involving *Mycoderma cerevisiae, Oidium lactis,* and various yeasts, produced "no appreciable changes" in the poi.

The native method of preparing poi is described.

Direct spectroscopic detection of the oxygen transferring enzyme in vinegar bacteria [trans. title], O. WARBURG and E. NEGELEIN (*Biochem. Ztschr., 262 (1933), No. 1-3, pp. 237, 238*).—The authors observed absorption bands of an oxygen-transferring respiration enzyme in suspensions of *Bacterium pasteurianum*, of which the density is reported as 0.3 cc of cells per cubic centimeter of the suspension. When the material was kept out of contact with air it showed a diffuse absorption band in the yellow. Saturation with carbon monoxide produced a darker and sharper band, of which the center appeared at 593 mμ. Saturation with oxygen caused the disappearance of the band in the yellow and of the two cytochrome bands in the green. Saturation with oxygen in the presence of hydrocyanic acid resulted in the disappearance of the yellow band and the appearance of a red band at 640 mμ, the cytochrome bands remaining in this case. The absorption band centering at 640 mμ is attributed to an oxidized form of the enzyme, which is said to be a hemin compound containing trivalent iron.

Home and farm preparation of vinegar, W. V. CRUESS and M. A. JOSLYN (*California Sta. Circ. 332 (1934), pp. 29, figs. 10*).—Noting that fruit unsuitable for sale fresh or for canning or drying, and honey too dark in color or otherwise unsatisfactory for the table, can often be made into vinegar for home use or for local sale, this circular discusses the principles involved and describes simple methods of preparing vinegar in the home and on the farm. It replaces Bulletin 287 (E.S.R., 38, p. 414).

AGRICULTURAL METEOROLOGY

The weather of 1933 in the United States, R. J. MARTIN (*U.S. Mo. Weather Rev., 61 (1933), No. 12, pp. 361, 362, pls. 2*).—It is stated that the year 1933 was considerably warmer than normal and that precipitation was below normal in nearly all sections. "In keeping with trends for a long time past, temperatures were abnormally high over most of the country. . . . Practically

all of the northern, southern, western, and interior portions of the country were drier than normal."

Monthly Weather Review, [November–December, 1933] (*U.S. Mo. Weather Rev., 61 (1933), Nos. 11, pp. 321–344, pls. 17, figs. 2; 12, pp. 345–376, pls. 14, figs. 41*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 11.—The North American High-Level Anticyclone, by T. R. Reed (pp. 321–325); Tennessee Fireball of August 21, 1933, by S. Bunch and C. P. Olivier (pp. 326, 327); An 18-Degree Halo, by E. M. Harwood (p. 327); A Halo of Unusual Radius, by R. G. Stone and S. Pagliuca (p. 327); The Mount Washington (New Hampshire) Halo of October 4, 1933, by W. J. Humphreys (pp. 328, 329); The Winter of 1932–33 at Fairbanks, Alaska, by R. L. Frost, (pp. 329, 330); Two Good Books on Meteorology (review) (p. 330); and Typhoons in the Far East during November 1933, by C. E. Deppermann (p. 338).

No. 12.—Correlation Periodogram Investigation of English Rainfall, by D. Alter (pp. 345–350); Significant Changes in the Rainfall at Some Localities, by D. A. Pack (pp. 350–352); A comparison of drought conditions in Georgia and Arkansas, by G. W. Mindling (pp. 352, 353); A Study of the Variation in Annual Rainfall of Oahu Island (Hawaiian Islands) Based on the Law of Probabilities, by W. T. Nakamura (pp. 354–360); Preliminary Statement of Tornadoes in the United States during 1933 (p. 360), and The Weather of 1933 in the United States (pp. 361, 362) (see p. 159), both by R. J. Martin; and Tropical Storms of 1933, by G. E. Dunn (pp. 362, 363).

Climatological data for the United States by sections, [November–December, 1933] (*U.S. Dept. Agr., Weather Bur. Climat. Data, 20 (1933), Nos. 11, pp. [200], pls. 3, figs. 3; 12, pp. [202], pls. 3, fig. 1*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Meteorological observations, [January–February, 1934], C. I. Gunness and H. Jenkins (*Massachusetts Sta. Met. Ser. Buls. 541–542 (1934), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Meteorological tables, D. A. Seeley and A. E. White (*Mich. State Bd. Agr., Ann. Rpt. Sec., 72 (1933), pp. 151–164*).—Data corresponding to those previously noted (E.S.R., 71, p. 11) are reported for the year ended June 30, 1933.

SOILS—FERTILIZERS

[Soil and fertilizer experiments of the Indiana Station] (*Indiana Sta. Rpt. 1933, pp. 46, 54, 57–59*).—Fertilizer experiments at the Moses Fell Annex, Pinney-Purdue, Herbert Davis Forestry, and Purdue-Vincennes Farms are briefly summarized, and results are given indicating the extent of phosphorus and potash deficiencies in Indiana soils.

[Soil and fertilizer investigations of the Michigan Station], C. E. Millar (*Michigan Sta. Rpt. 1933, pp. 250–254*).—Results are briefly noted on fertilization of beans, reduction of loss of nitrogen from manures by the addition of superphosphate, the economy and efficiency of finely ground limestone, spring applications of nitrogen to wheat, placement of fertilizers for corn, value of nitrogen for pastures, and the reaction of muck soils and their improvement by fertilizers and copper sulfate.

[Soils and fertilizer studies in New Mexico] (*New Mexico Sta. Rpt. 1933, pp. 25, 44, 45*).—The station reports work on the subsoiling of impermeable soils and a study of the effect of irrigation on soil profiles.

[Soil investigations of the Washington Experiment Station] (*Washington Sta. Bul. 291 (1934), pp. 15–17, 18, 48–50, 62, 63*).—Results are noted of studies on the maintenance of organic matter in eastern Washington soils and the value of nitrogen fertilizers for meadows and pastures, both by S. C. Vandecaveye and L. C. Wheeting; the management of the irrigated soils, and the utilization of irrigation water and its influence on soil composition; tillage and soil moisture problems, erosion control and run-off, and permanent fertility and organic matter maintenance, all by H. M. Wanser; soil moisture investigations, by W. A. Rockie and A. J. Johnson; producing power of gray alluvial soils, by Rockie and P. C. McGrew; and producing power of rich black soil on ridge tops and fertilizer applications for stubble decay, both by Rockie.

Outlying experiment fields as a means of determining the fertility of different soil types, F. L. Duley (*Jour. Amer. Soc. Agron., 26 (1934), No. 1, pp. 25–29*).—The author of this contribution from the Kansas Experiment Station finds that "it must be admitted that when soil experiment fields are used it becomes necessary to apply the results of relatively accurate tests made at one location over a wide area, much of which may have considerably different requirements than the soil where the tests were made. In the case of laboratory and greenhouse tests or short-time trials by farmers the results of perhaps less accurate determinations are applied to very limited areas. Both methods of testing may, therefore, have a place in determining the need of different soil types."

Agricultural classification and evaluation of North Carolina soils, including the fertilization of crops on soil groups, C. B. Williams, W. B. Cobb, and H. B. Mann (*North Carolina Sta. Bul. 293 (1934), pp. 157, figs. 36*).—This bulletin discusses the following major topics: The importance of land evaluation, factors which determine soil characteristics, effects of climate on agriculture, soil types by provinces and groups, a key for identifying the soils of North Carolina, description of soils by series within soil groups, and the most extensive soils, special crop adaptations to different soil types and their significance, relative value of North Carolina soils for the production of adapted crops, how soils lose their fertility, plant food needs of North Carolina soils, fertilizers for different crops, precautions in compounding and applying fertilizer mixtures, lime—its sources, functions, and when needed, areas of the State and their agriculture, and appraisal of soil types for different crops by areas.

A key to the soils of Ohio, G. W. Conrey and A. H. Paschall (*Ohio Sta. Spec. Circ. 44 (1934), pp. 32, fig. 1*).—The important soil types of Ohio are described in tables constituting the major part of the circular. The soils are grouped on the basis of their occurrence in the major soil areas of the State, shown on an accompanying map. Within each area the soils are further classified on the bases (1) of origin of the parent material, whether glacial, residual, lacustrine, or alluvial, (2) of topography, (3) of color of surface soil, (4) of color and character of subsoil, and (5) of character of and depth to the parent material.

Crop productivity ratings for the most important soil types are included, two ratings being used in the tables: "First, a state-wide productivity rating and, second, a crop production rating or crop productivity index. In the state-wide productivity rating the most productive soil (with good soil management) is rated as '1' and the least as '10.' In the crop production rating or crop

productivity index, the most productive soil for any given crop is rated as '10', and all other values are lower."

An inexpensive lysimeter, P. E. Karraker (*Jour. Amer. Soc. Agron., 26 (1934), No. 1, p. 75, fig. 1*).—Lysimeters for the measurement of nitrogen leaching were cheaply made from ordinary 55-gal. steel drums. A portion cut from the top of each drum was used to separate the soil compartment from the drainage water reservoir which consisted of a suitably formed cement chamber cast in the bottom of the drum. The author of this communication from the Kentucky Experiment Station states that 22 such lysimeters have been placed in openings, the soil from which was used to fill them, at a cost of about $130.

A soil hygrometer for irrigated cane lands of Hawaii, A. F. Heck (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 274–278, figs. 3*).—Essentially, the apparatus described by the author of this contribution from the Wisconsin Experiment Station consists of a finely porous filter candle placed at the depth of maximum root development and connected to a mercury manometer through a length of copper tubing to form a system completely filled with water to the surface of the mercury. The zero point of the instrument is located by immersing the filter candle in water. The whole device is mounted on a rigid metal frame about 3 ft. long. The instrument may be calibrated to read the percentages of soil moisture; but this must be done for each individual soil.

In the case of the crop and soils especially considered, "with the instrument set at a depth of 12 in., a reading of 20 to 30 cm of mercury indicates the need of more water in the soil."

A new stirrer for the hydrometer method of mechanical analysis of soils, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, p. 352*).—To eliminate the rather rapid wear and concomitant loss of dispersing efficiency of the stirrer used in preparing soils for the hydrometer method of mechanical analysis, the originator of the method (E.S.R., 57, p. 710) proposes in the present contribution from the Michigan Experiment Station a new stirrer which consists of a stirring rod or shaft onto which is screwed a solid button or paddle made of casehardened steel. "The paddle lasts longer than the old type, and when it becomes worn it can be unscrewed and replaced with a new one without having to change the shaft. The paddle is very inexpensive, and it can be changed often so as to maintain the high dispersing efficiency of the method. It is strongly urged upon those who are now using the hydrometer method to replace the old stirrer with the new one. To effect the change it is only necessary to purchase a new shaft and paddle."

A study of drought in southern Martinique for the purpose of finding a remedy [trans. title], J. Hervé (*Bul. Agr. Martinique, n. ser., 2 (1933), No. 4, pp. 154–165*).—The author concludes that the increasing damage from drought in this once very productive region is not due to decrease in rainfall, but to increased run-off, erosion of permeable surface soil, decline in organic matter, and reduction of the capacity of the soil for holding water. Loosening of the subsoil by use of explosives and the growing and turning under of cover crops are recommended as economical means of improving the conditions. Attention is called particularly to *Gliricidia maculata*, which makes rapid growth under dry conditions, as especially fitted for use as a cover crop. The creation by cultural means of a subterranean reserve of water appears to be the most important need.

The influence of cropping system and fertilization on the reaction of Sassafras silt loam soil, H. C. Harris (*Jour. Amer. Soc. Agron., 26 (1934), No. 1, pp. 29–34*).—The author of this contribution from the Delaware Experiment Station investigated the effect upon the reaction of plats of Sassafras

silt loam soil of fertilizer treatment begun in 1908 and of various types of rotation. Under the conditions locally encountered the fertilizer combinations used were shown to have had no appreciable effect upon the reaction of the soil. It is thought very probable that the lowering of the pH values on plats cropped to a rotation is a result of the removal by the larger crops obtained from the rotation of quantities of calcium greater than those taken up by the smaller crops from the continuous grown plats.

Influence of the carbon-nitrogen ratios of organic matter on rate of decomposition in the soil, I. J. Hutchings and T. L. Martin (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 333–341*).—During the decomposition of alfalfa and sweetclover roots and tops and straw in the soil, nitrate accumulation increased as the carbon dioxide evolution decreased. The addition of sodium nitrate to narrow the C:N ratio stimulated carbon dioxide evolution during the first few days. The addition of sodium nitrate delayed the maximum accumulation of nitrate. Where sodium nitrate was added the alfalfa roots and straw-treated soils showed greater nitrate accumulation, "due either to increased nitrification or decreased nitrate assimilation." Nitrate accumulation was depressed through the 30-day period for alfalfa and sweetclover tops and sweetclover roots when cellulose was used to widen the C:N ratio. Nitrate accumulation in the soil treated with the sweetclover roots was depressed when sodium nitrate was used to narrow the C:N ratio. The use of sodium nitrate to narrow the C:N ratio of straw tended to cause an accumulation of nitrate. Narrowing of the C:N ration to 10:1 and widening it to 80:1 by means of sodium nitrate and cellulose, respectively, using alfalfa tops and roots, sweetclover tops and roots, and straw, influenced very little the relative rate at which these materials decomposed as measured by carbon dioxide evolution. "These facts indicate that the chemical composition of the material is a very important factor to be considered when discussing the rate at which organic matter decomposes."

Nitric nitrogen in the soils of the Arkansas Valley, R. Gardner, A. Kezer, and J. C. Ward (*Colorado Sta. Tech. Bul. 6 (1934), pp. 40, figs. 3*).—In studies covering a period of 10 years, the average nitric nitrogen content in the upper 4 in. of soil during the season was found to vary with the type of crop grown and to range from 12.7 to 39.2 p.p.m. The average maximum reached during the season ranged from 24.0 to 78.8 p.p.m. The addition of crop residues sufficient to add 36.6 lb. of nitrogen per acre had only a slight effect on the nitrate content of the soil. No significant differences in the effect of various green manures were observed. Barnyard manure greatly increased the soil nitrate content. A study of the rates of accumulation of nitrates and other salts in the soil showed that the other salts accumulated much more rapidly than the nitrates under any farming conditions which would allow salt accumulation. A study of the source of nitrates in the soil showed that most of the nitrates under normal conditions were from nitrogen fixed in situ, but the study indicated that a large percentage, if not all, of the nitrates in very poorly drained soil was introduced by the water.

A series of experiments with water cultures, pot cultures, and field plats indicated that the tolerance of the field crops studied is approximately the same for nitrates as for the other common "alkali" salts normally found in the soil.

"A comparison of crop yields under different nitrate concentrations in the field indicates that within the range of nitrate concentrations studied, which is assumed to be approximately the normal range, the yield increases with the nitrate content if any relationship exists. From the quantities of nitrates usually found in the soil and the study of the quantities to which crops appear

tolerant, the conclusion has been drawn that excessive nitrates in the Arkansas Valley are not normally a cause of reduced yields and are possibly not always sufficient for maximum yields."

Extremely high nitrate concentrations were shown to be limited to areas of poor drainage and to be accompanied by concentrations of other salts sufficient to be more toxic than the nitrates.

Decomposition of polyuronides by fungi and bacteria.—I, Decomposition of pectin and pectic acid by fungi and formation of pectolytic enzymes, S. A. Waksman and M. C. Allen (*Jour. Amer. Chem. Soc., 55 (1933), No. 8, pp. 3408–3418*).—The authors of this contribution from the New Jersey Experiment Stations isolated from soils several fungus forms capable of decomposing pectin and polygalacturonic acid. In the decomposition of the polyuronides, the simple uronic acids were first produced; these were then decomposed further by the organism. Different fungi varied in the rate and nature of decomposition of the uronic acid complexes. These fungi produced pectolytic enzymes which hydrolyzed pectin and polygalacturonic acid. It is proposed to designate as a unit of pectolytic enzyme that amount of enzyme which will hydrolyze 1 mg of polygalacturonic acid in 1 hr. at 40° C. and at pH 4.0 to 6.0. Using this unit of measurement, 1 g of a dry enzyme preparation of certain fungi contained about 4,000 pectolytic units. As a result of the action of the enzyme on pectin and polygalacturonic acid, a small quantity of sediment, which seemed to contain either a ligninlike complex or a higher polyuronide not hydrolyzed by cold 80 percent sulfuric acid or by hot 5 percent sulfuric acid, was formed.

Fertilizers increase alfalfa and clover yields on heavy soils, R. L. Cook (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 191–196, figs. 2*).—Results of fertilizer experiments, for the most part of the usual character, are detailed.

The effect of superphosphate, hydrated lime, and straw on the loss of nitrogen from manure during storage, L. S. Carter and C. E. Millar (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 136–146, figs. 7*).—Quantities of poultry manure to which had been added 5, 10, and 20 percent of 20-percent superphosphate, 10 percent of 44-percent superphosphate, and 10 percent of hydrated lime, respectively, were stored in 1,000-cc Erlenmeyer flasks with continuous aeration at laboratory temperature. The quantities of nitrogen given off as ammonia were determined at intervals of 1 or 2 days. All additions of superphosphate reduced the rate of loss and total loss of ammonia. The amount of ammonia lost decreased as the rate of application of phosphate increased. The 44 percent superphosphate was slightly less effective than a quantity of 20 percent superphosphate supplying slightly less P_2O_5. Hydrated lime caused loss of ammonia at a rapid rate, especially during the early part of the storage period.

Cow manure treated with 50 lb. of hydrated lime per ton before storage was as good a fertilizer as the manure stored without treatment. Hydrated lime applied before storage at the rate of 100 lb. to the ton of cow manure and of 200 lb. to the ton of poultry manure greatly decreased the fertilizing value of the manure.

Quantities of cow manure to which had been added 2.5 and 5 percent of 20-percent superphosphate, 2.5 percent of 44-percent superphosphate, and 2.5 and 5 percent of hydrated lime, respectively, were stored as described above. The conclusions as to losses of ammonia were similar to those from the experiments with poultry manure. "Considering reduction in loss of ammonia and relative cost, it would seem that 20-percent superphosphate at the rate of 2.5 percent of the weight of the wet manure would be the most practical quantity to sprinkle in the gutters of dairy barns, providing the laboratory results could

be duplicated under conditions at the dairy barn. This quantity would amount to about 2 lb. of superphosphate per day for each mature cow."

The numbers of bacteria and of fungi in the manure at the end of the storage period were increased by additions of superphosphate to the manure before storage.

Both poultry and cow manure to which phosphate had been added before storage proved better fertilizers for corn grown on sandy loam soil in 2-gal. pots than did the manure stored without phosphate.

Calcium cyanamid as a nitrogenous fertilizer, T. R. MOYER (*Soil Sci.*, *37* (*1934*), *No. 4, pp. 305–330, pl. 1*).—In the experiments of the author of this contribution from the New Jersey Experiment Stations calcium cyanamide, properly applied, gave crop yields equal to those produced by an equal quantity of nitrogen from other high-grade materials, the average nitrogen recovery being equal for calcium cyanamide, sodium nitrate, ammonium sulfate, and urea. In a very acid sand, under conditions that do not allow leaching (as in pots), sodium nitrate was found slightly superior to calcium cyanamide; and this, in turn, gave a much greater yield of dry matter and recovery of nitrogen than did ammonium sulfate. The nitrogen from calcium cyanamide did not leach from the soil as readily as did that from sodium nitrate or from ammonium sulfate.

The high percentage of calcium in calcium cyanamide was found to have a beneficial effect upon the physical properties of the soil, and calcium cyanamide was found to bring about a greater temporary decrease in H-ion concentration than did an equal weight of C.P. calcium hydroxide. It showed a permanent physiologically alkaline effect.

It is also noted that "pulverized calcium cyanamide may be used to destroy weeds in grassland or small grains. It should be applied in the early spring and in the morning while the dew is still on the plants. The grass or grain itself usually changes from a green to a brownish color for a very short period, after which growth is rapid as a result of the available nitrogen present and of the elimination of a large percentage of the weeds."

Electrodialysis as a means of studying the nature of soil phosphates, L. A. DEAN (*Soil Sci.*, *37* (*1934*), *No. 4, pp. 253–266, figs. 6*).—The author of this contribution from the Wisconsin Experiment Station investigated (1) the electrodialysis of readily soluble phosphate compounds, (2) the electrodialysis of difficultly soluble phosphate compounds, (3) the total quantity of phosphate removed from soils by electrodialysis as compared to that removed by the Truog method (E.S.R., 64, p. 312) of acid extraction, and (4) the nature of the difficultly soluble phosphates present in soils.

Electrodialysis, like extraction with acid, removed readily soluble phosphate compounds from soils, and an electrodialysis continued for 60 hr. removed more phosphate from some calcareous soils than did five extractions with 0.002 N H_2SO_4. Electrodialysis did not, however, remove phosphate from iron phosphates of soils nearly so rapidly as did extractions with 0.002 N H_2SO_4.

The difficultly soluble phosphate compounds of all the soils studied seemed to be similar, as shown by its behavior in electrodialysis and in acid extractions. The difficultly soluble phosphates formed by adding soluble phosphate to hydrated iron oxides appeared to be similar to the difficultly soluble phosphates present in soils. The phosphate naturally present in a lateritic soil containing 1.35 percent phosphorus was found similar to dufrenite in solubility. The difficultly soluble phosphate compounds formed by the addition of soluble phosphate to some soils appeared also to be similar to dufrenite. Under suitable conditions, "the specific rate of removal of phosphate from soils by elec-

trodialysis may be used advantageously as an index of identification of the nature of the phosphate compounds present." On the other hand, the determination of readily soluble phosphorus for practical purposes could be made not only more quickly and economically by acid extraction than by electrodialysis, but also with greater dependability.

The fixation of phosphates by soil colloids, G. D. SCARSETH and J. W. TIDMORE (*Jour. Amer. Soc. Agron., 26 (1934), No. 2, pp. 138–151, fig. 1*).—The quantity of phosphate occurring in soil colloids in the available state was found to vary directly with the silica : sesquioxide ratio of the colloid, according to the results here reported from the Alabama Experiment Station. The phosphate-fixing capacity appeared to vary, in these trials, inversely with the colloid silica : sesquioxide ratio. Fixation of the phosphate from orthophosphoric acid, dicalcium phosphate, and tribasic sodium phosphate was about equal in the colloids with a high silica : sesquioxide ratio when the degree of calcium saturation was below 100 percent. The lower the silica : sesquioxide ratio the smaller was the influence of the degree of calcium saturation below 100 percent on the amount of phosphate fixed by the colloid. The native phosphate in soil colloids showed about the same solubility in hydrogen-saturated as in calcium-saturated colloids, but it was most soluble in the colloids "supersaturated" with calcium. The greatest phosphate solubility observed appears to have occurred usually in the presence of twice the saturation quantity of calcium. Dicalcium and sodium phosphates were slightly more available than the orthophosphoric acid in the colloids with the low silica : sesquioxide ratios. Slightly more of monocalcium phosphate was fixed than of dicalcium phosphate in all the colloids.

Tricalcium phosphate was about 10 percent less available than monocalcium phosphate in the gray colloids and about equal to it in the red colloids. The rock phosphate was approximately 20 percent less available than monocalcium phosphate in the gray colloids and was slightly more available than monocalcium phophate in the red colloids. At pH 5.4, about 76 percent of the PO_4 added as monocalcium phosphate to the red colloid was insoluble in buffered 0.05 N H_2SO_4, the phosphate application being equivalent to 13,000 lb. of 16 percent superphosphate per acre to a soil containing 60 percent colloids. In the least weathered colloid the concentration of phosphate ions brought into solution by 0.05 N H_2SO_4 at pH 3.0 was considerably decreased after 16 hr. The concentration of phosphate ions was not decreased after 16 hours' contact with a 0.1 N H_2SO_4 solution.

The fixation of phosphates by clay soils, G. D. SCARSETH and J. W. TIDMORE (*Jour. Amer. Soc. Agron., 26 (1934), No. 2, pp. 152–162, figs. 3*).—Full response to phosphate fertilization on highly colloidal Alabama soils was not obtained until the phosphate applications reached 1,800 and 2,000 lb. of superphosphate per 2,000,000 lb. of the acid and of the calcareous soils, respectively.

Calcium carbonate greatly decreased the availability of readily soluble phosphates and depressed the crop yield when applied immediately before planting to the acid clay soil. After equilibrium was established and $CaCO_3$ was no longer present in the soil, however, the availability of the phosphates increased as indicated by yields. Calcium carbonate decreased the availability of tricalcium phosphate, as measured by plant growth.

The efficiency of the various phosphates used, as measured by plant response, decreased rapidly after contact with the soil. In the acid soil, dicalcium phosphate was slightly more available than monocalcium phosphate. The relative efficiencies for monocalcium, tricalcium, monoammonium, ferric phosphates, and superphosphate were 100, 57, 110, 25, and 117, respectively. In general, the

more soluble the phosphate used the more rapid was the fixation. On the other hand, relatively insoluble phosphates were fixed slowly but were inefficient in supplying available phosphorus to the plants.

The effect of mono-, di-, and tricalcium phosphates on the reaction of soils of different degrees of acidity, W. H. PIERRE (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 278–289, fig. 1*).—In a series of small-scale laboratory experiments carried out at the West Virginia Experiment Station and designed to indicate the effect of various phosphates on soil reaction after 6 weeks and after 18 mo., monocalcium phosphate was found to have, on a soil of pH 4.28, a neutralizing action approximately equivalent to its calcium content, whereas on a soil of pH 5.63 it had no effect, and on a soil of pH 6.40 it had a slightly acidifying action. The action of superphosphate on the most acid of the soils appeared about the same as that of monocalcium phosphate, but on the soils of the two higher pH values it had a slightly greater acidic action than the latter. "This is believed to be temporary and due at least in part to the higher salt concentration in the soil resulting from the calcium sulfate of superphosphate." Dicalcium phosphate was found to have a neutralizing effect on the very acid soil (pH 4.28) approximately equivalent to its total calcium content. On a soil of pH 5.63 the effect was that of approximately one half its calcium content. The salt had only a very slight effect on a soil of pH 6.40. Tricalcium phosphate showed a neutralizing effect in the soil slightly lower than that of dicalcium phosphate, "possibly due to its lower solubility." Monosodium phosphate was found to have a greater basic action than monocalcium phosphate, an effect considered probably a result of the high content of sodium introduced into the exchange complex.

"It is concluded from these results that for most soils of the humid regions, the pH values of which lie mostly between 5 and 6, superphosphate, rock phosphate, and monocalcium phosphate can be considered to have no appreciable effect on soil reaction, whereas hydrated dicalcium and tricalcium phosphate can be considered basic."

Available phosphorus in soil and the phosphorus content of grain as influenced by phosphorus applications to soil, A. G. WEIDEMANN (*Jour. Amer. Soc. Agron., 26 (1934), No. 2, pp. 170–178*).—It was found that the untreated soil used in this investigation from the Michigan Experiment Station contained somewhat less of readily available phosphorus than the concentration suggested by Truog (E.S.R., 36, p. 626) as being sufficient for crop production on similar types of soil under Wisconsin conditions. About 400 lb. of 20 percent superphosphate per acre were required to produce a measurable increase in the amount of readily available phosphorus in the soil, however, and no consistent increase in yield of any of the crops grown resulted from applications of phosphorus in addition to nitrogen and potassium.

"The increases in phosphorus content of grain, if any, due to phosphorus applications to the soil were slight and usually inconsistent. The increases in phosphorus content of chaff and straw due to these treatments were very noticeable in some cases, although not very consistent." It is considered better to add such phosphatic supplements as may be needed directly to the grain, when this is to be used as feed, rather than to attempt increasing the phosphate content of the grain by soil treatment.

The fixation of potash in difficultly available form in soils, N. J. VOLK (*Soil Sci., 37 (1934), No. 4, pp. 267–287, figs. 4*).—In the experiments reported upon in this contribution from the Wisconsin Experiment Station, alternate wetting and drying of soils treated with soluble potassium salts caused rapid fixation of the potassium in a nonreplaceable form. When these soils were kept

continuously moist, very little fixation of this kind took place. Alternately wetting and drying 10 times usually sufficed to cause a maximum amount of fixation. In four of the soils investigated, the ultra clay fraction contained the lowest percentage of total potash, but, on the other hand, was by far the most active fraction in the fixation of potassium. In 100 soils, treated with 1,000 lb. of potash per acre, the potassium fixed ranged from none to all that was added.

"Fixation is dependent on the nature of the colloids as well as the quantity. A lateritic soil, containing around 90 percent colloid, did not fix potash, whereas Miami silt loam, containing only 24 percent of colloid, fixed 495 lb. per acre out of 1,000 lb. added. Potash fixation was reduced by leaching soils with HCl, and increased by leaching them with Na_2CO_3. Most soils alternately wetted and dried after treatment with 3 tons of calcium hydroxide per acre were found to fix more potassium than those not treated with calcium hydroxide. Synthetic mixtures of alumina gel, silica gel, calcium hydroxide, and sand did not fix potash. Mineralogical, chemical, and X-ray analyses of Hagerstown silt loam from the Pennsylvania Station experimental plats, some of which had received 5,000 lb. per acre of potassium chloride over a period of 50 yr., led to the conclusion that a portion of the added potassium had reacted with colloidal silicates and become fixed in the form of muscovite, thus converting added available potassium into difficultly available form.

"From a practical standpoint it would seem to be advisable to make frequent moderate applications of potash fertilizer rather than less frequent large applications, and also to apply the potash to a greater depth than is usually practiced, in order to lessen the influence of alternate wetting and drying. Localized application would also tend to reduce fixation."

The Bray method for available potassium, applied to soils of known potassium treatment, A. L. Prince and A. W. Blair (*New Jersey Stas. Circ. 292 (1934), pp. 7*).—Report is made upon trials of the Bray available potassium test (E.S.R., 67, p. 363) carried out on soils of which the fertilizer treatment has been under control by the stations during 25 yr.

"From these tests . . . it would appear that the Bray method may be used to give an indication of the readily available potassium. However, for the inexperienced worker there is difficulty in interpreting the results, and therefore great care is required.

"Differences in soil type, soil management, and crop requirements make it difficult to give specific recommendations with reference to the point at which potassium fertilizers may be withheld. The results here reported would seem to indicate that for corn, wheat, oats, clover, and alfalfa on loam soils 80 lb. of available potassium to the acre or less may be regarded as low, and that on such soils the crops mentioned may show a response to applications of potassium salts. Around 140 lb. to the acre or above may indicate good crop growth, other conditions being favorable."

The data obtained indicated that the amount of the available potassium is not greatly affected by the soil reaction, although there was in some instances an indication of a slightly greater concentration of available potassium in the limed soils.

The replaceable potassium content compared with field response to potash fertilization of some Oklahoma soils, H. F. Murphy (*Jour. Amer. Soc. Agron., 26 (1934), No. 1, pp. 34–37*).—Oklahoma soils containing less than 60 p.p.m. of replaceable potassium were found generally to respond to potash fertilization, other conditions being favorable for plant growth. Cropped soils were found to contain less replaceable potassium than virgin soils. The

replaceable potassium content of a manured soil was much higher than that of a corresponding soil which had never been manured.

The potassium-lime problem in soils, H. JENNY and E. R. SHADE (*Jour. Amer. Soc. Agron., 26 (1934), No. 2, pp. 162–170, fig. 1*).—Experiments on the potassium-clay-calcium carbonate interchange in purified soil colloids, permutites, and natural and artificial soils, carried out at the Missouri Experiment Station, indicated that in all these systems lime liberated adsorbed potassium in large quantities. It could not be observed that the hydroxyl and bicarbonate anions reduced the potassium replacement below the values obtained with ordinary distilled water; on the contrary extensive exchange took place in the presence of the chloride, sulfate, carbonate, bicarbonate, hydroxyl, and phosphate anions. Carbonic acid liberated considerable quantities of adsorbed potassium. When calcium carbonate was added to such a potassium-clay-carbonic acid system, a decided increase in the potassium outgo occurred. This was attributed to the large number of calcium ions resulting from the formation of calcium bicarbonate. In the presence of adsorbed H ions, the replacement of potassium by calcium carbonate was intensified when the resulting partial carbon dioxide pressure approached that of soil air.

Micro-organisms reduced the leaching of potassium as compared with that observed in sterile systems. This reduction was most pronounced in the presence of calcium carbonate. In the case of a relatively low potassium level, but otherwise favorable microbiological conditions, "addition of $CaCO_3$ may actually cause a reduction of the K content of the soil solution below the value of the unlimed soil which is attributed to biological readsorption of K and ionic exchange impedance. It is believed that the occasional observations of the lack of K solubility and availability after liming are not necessarily violations of the general base-exchange principles, but may be the result—in part at least—of interference by micro-organisms."

The distinction between magnesium absorbed and that exchangeable, four years after lysimeter incorporations of oxides and carbonates, W. H. MACINTIRE, W. M. SHAW, and B. ROBINSON (*Soil Sci., 37 (1934), No. 4, pp. 289–303, fig. 1*).—Lysimeter trials reported from the Tennessee Experiment Station were held to justify, among numerous inferences, those indicated below.

"The quantities of magnesium absorbed from 32-ton additions were much greater than those found for 8-ton treatments," but the minimal absorption greatly exceeded the exchange capacity as usually measured. The absorbed magnesium was found to be resistant to eight successive leachings and also to four successive extractions with a normal solution of ammonium chloride, the values obtained by the two procedures being comparable. Since immediate additions equal to the unabsorbed residues were completely recovered by the first of eight ammonium chloride leachates, the prolonged extraction of absorbed magnesium by multiple leachings was supposed to be attributable to "a continued yield of magnesium from the absorption complex, and not to direct solvent action upon the unabsorbed magnesium residues." Dilute acid extractions were found to be more effective in the recovery of absorbed magnesium than either leachings or extractions with ammonium chloride.

"The exchange capacities of the untreated soil and those of the magnesium-treated soils were found to be identical. . . . A definite increase in the alumina dissolved from the magnesia-treated units indicated that the added magnesium had disrupted the aluminum complex."

Inspection of agricultural lime products, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 71 (1933), pp. 8*).—This tabular summary of the composition of the various liming products sold in Massachusetts during the year 1933 also shows the comparative cost of units of effective oxides present.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1933, C. S. CATHCART (*New Jersey Stas. Bul. 561 (1934), pp. 15*).—This supplements Bulletin 557 (E.S.R., 70, p. 594) with the usual analyses and discussion.

AGRICULTURAL BOTANY

Aims and objectives of plant introduction of the U.S. Department of Agriculture, K. A. RYERSON (*Bul. Torrey Bot. Club, 61 (1934), No. 2, pp. 75–79*).—This brief discussion includes a list of the exploratory expeditions sent out by the Department from 1927 to 1932 to meet the requirements of plant breeders for foreign material.—(*Courtesy Biol. Abs.*)

British economic grasses: Their identification by the leaf anatomy, S. BURR and D. M. TURNER (*London: Edward Arnold & Co., 1933, pp. 94, figs. 111*).—In order to help those studying pastures and other grasslands in Great Britain to identify grasses at any stage of growth without regard to floral characteristics, the authors have prepared two diagnostic keys, one based on anatomical and the other on vegetative characters, of about 60 important species and varieties. These are followed by descriptions of each kind of grass, illustrated by clear drawings showing the anatomy of the leaf in cross section and the shape and arrangement of the sheath and leaf blade within the shoot. Laboratory identification is thus made possible with the aid of microscopic examination of free-hand sections of shoots. A glossary is combined with the index.

[Papers presented before the physiological section of the Botanical Society of America, Boston, Mass., December 28–30, 1933] (*Amer. Jour. Bot., 20 (1933), No. 10, pp. 669–683*).—Among the papers presented at this meeting were the following: The Stimulating Effect of Copper on Chlorophyll Formation, by W. E. Burge, G. C. Wickwire, and O. S. Orth (p. 669); The Wetting Properties of Certain Latex Particles as Shown by the Mudd Interfacial Technique, by L. S. Moyer (pp. 669, 670); Further Experiments on the Effect of Chemicals on the Respiration (CO_2 Output) of Potato Tubers, by L. P. Miller (p. 670); Factors Affecting the Rest Period of Plants, by W. E. Loomis (pp. 670, 671); The Effect of Ethylene Chlorhydrin on the Acid-Base Metabolism of Potato Tubers in Relation to the pH of the Expressed Juice, by J. D. Guthrie (p. 671); A Computation Concerning the Importance of Respiration Water to Young Wheat Seedlings, by B. E. Livingston (pp. 671, 672); The Formation of Cellulose Membranes by Microscopic Particles of Uniform Size in Linear Arrangement, by W. K. Farr and S. H. Eckerson (p. 672); Composition of the So-Called Middle Lamella in the Cambium and Its Lignified Derivatives, by T. Kerr and I. W. Bailey (pp. 672, 673); The Nature and Distribution of Plasmodesma in the Tobacco Plant, by L. G. Livingston (p. 673); Some Effects of Radiation from a Quartz-Mercury Arc Upon the Mineral Composition of Plants, by W. D. Stewart and J. M. Arthur (pp. 673, 674); Injury to Plants from Vapors of Mercury and Compounds of Mercury, by P. W. Zimmerman and W. Crocker (p. 674); Toxic Action in Soil of Illuminating Gas Containing Hydrocyanic Acid, by A. E. Hitchcock, W. Crocker, and P. W. Zimmerman (pp. 674, 675); Starch Determinations with Takadiastase, by F. E. Denny (p. 675); A Method for Determining the Relative Humidity in the Intercellular Spaces of Living Plant Tissues, by L. Shaw (pp. 675, 676); Prosenchyma an Orientation of Parenchymal Cells of Fundamental Importance, by F. T. Lewis (p. 676); Dormancy in Tilia Seeds, by L. V. Barton (p. 676) (see p. 176); Plastid Structure and Its Possible Effect on

Photosynthesis, by T. E. Weier (p. 677); A Study to Determine the Range of Wave-Length Most Effective in Stimulating Reproductive Growth in *Marchantia*, by N. A. Schappelle (p. 677); Yarovization Formulas for Winter Oats and Barleys, by D. N. Borodin (pp. 677, 678); The Effect of Carbon Dioxide and Some Other Gases on the Germination of Seeds of *Poa compressa*, by A. M. Andersen (pp. 678, 679); The Location and Concentration of the Virus of Tobacco Mosaic Within the Cells, by B. M. Duggar and L. G. Livingston (p. 679); Effect of Boron on the Availability of Iron, by A. G. Rodriguez (p. 679); The Growth of Yeast in Water Containing Deuterium, by O. W. Richards (pp. 679, 680); Investigations on the Use of Certain Amino Acids by Green Plants (p. 680) and Effect of X-Rays on Fern Prothalli (pp. 680, 681), both by L. Knudson; The Effect of Small Amounts of Copper on the Growth of *Chlorella* and *Lemna*, by E. F. Hopkins (p. 681); Further Observations on the Physiological Effect of the Heavy Hydrogen Isotope on *Spirogyra*, by T. C. Barnes (pp. 681, 682); and Physicochemical Reactions in the Tissues of Ripe Pineapple Fruits, by C. P. Sideris and B. H. Krauss (pp. 682, 683).

Plant chemistry and plant relationship, H. Molisch (*Pflanzenchemie und Pflanzenverwandtschaft. Jena: Gustav Fischer, 1933, pp. VIII+118, figs. 12*).—In the introduction to this monograph on plant chemistry and plant relationships, the author discusses the significance of morphology, anatomy, compatibility in grafting or budding, and phytochemistry for systematics, following which the main sections take up in turn the presence of specific substances in related plants; the special bases (inorganic and organic) for the connection between chemistry and relationship; reactions (immunological, etc.) that show relationships; successful transplantation (budding and grafting) as depending on relationship; chemical differences between male and female plants; relationship and individual specificity of substances; chemical composition and morphology; and plant hormones. A list of the more important works on the general subject is given at the end of the volume.

Chlorophyll production under various environmental conditions, G. B. Ulvin (*Plant Physiol., 9 (1934), No. 1, pp. 59–81, figs. 8*).—Soybean and radish plants were grown in 10-hr. light periods and continuous light; sweet corn plants were grown in the presence and absence of Fe and Mn; and sugarcane plants were grown with nitrogen furnished as NO_3 and NH_3 at soil temperatures of 15°, 25°, and 30° C. All plants were grown in greenhouses in quartz sand but with different nutrient solutions. The chlorophyll extractions and separations were slight modifications of the methods of Schertz (E.S.R., 62, p. 616). The colorimetric determinations were made in comparison with the chemical standard of Guthrie (E.S.R., 60, p. 624). Thinner and larger leaves occurred on the soybean plants in continuous light. On the average the following environmental conditions produced more chlorophyll than the contrasting treatments: (1) Continuous light, (2) presence of iron, and (3) nitrogen applied as NO_3.—(*Courtesy Biol. Abs.*)

Copper in relation to chlorophyl and hemoglobin formation, O. S. Orth, G. C. Wickwire, and W. E. Burge (*Science, 79 (1934), No. 2037, pp. 33, 34*).—According to this contribution from the University of Illinois, the addition of $CuSO_4$ to the soil of a Florida orange grove in which the leaves were yellow instead of green ("frenched"), caused the leaves to turn green and the trees to grow better. The green leaves had 4.6 times as much chlorophyll, apparently because the presence of copper enabled the leaf cells to manufacture it.—(*Courtesy Biol. Abs.*)

Water culture investigations with Hoagland's "A–Z" solution [trans. title], W. Schropp and K. Scharrer (*Jahrb. Wiss. Bot., 78 (1933), No. 4, pp.*

544–563, figs. 8).—A description of a series of water culture experiments with wheat, rye, maize, oats, peas, beans, clover, alfalfa, and tobacco is given. Most of these plants were very favorably influenced by addition to the regular solution of small amounts of a solution containing B, Mn, Cu, Zn, Al, Ni, Co, Ti, Li, Sn, I, and Br. (The term "A–Z" to designate a supplementary solution of this type was proposed by A. R. C. Haas.)—(*Courtesy Biol. Abs.*)

Plant sap and juice, I, II (*Kans. Acad. Sci. Trans., 36 (1933), pp. 72–77, fig. 1*).—Two papers are presented.

I. *Hydrogen ion concentration and other data*, A. W. Barton (pp. 72–75).—The results so far obtained add confirmation to the statements that plant sap and juice are slightly acid, that there is little or no difference in pH between sap as it flows from plants and the juice obtained by pressure, and that fungi have less acid juice than phanerogams. A table shows the number of days on which there was sap flow of 20 plants in the spring of 1932 at Hays, Kans.

II. *Data obtained in the spring of 1933*, L. A. Brennan, R. Darland, F. M. Lee, and A. W. Barton (pp. 76, 77).—More proof is furnished that phanerogams have a slightly acid pH; that much moisture in the soil is favorable to a copious flow of sap, many plants not yielding any sap during a dry spring; that temperature has a regulatory influence on the flow of sap; and that sap ceases to flow when the buds burst.—(*Courtesy Biol. Abs.*)

Significance of transpiration, H. F. CLEMENTS (*Plant Physiol., 9 (1934), No. 1, pp. 165–172*).—In this contribution from the State College of Washington, transpiration is regarded as one of the most fundamental functions of plants, and, so far as fast-growing plants of large stature are concerned, it is to be classed with photosynthesis and respiration. Its benefits are as follows: (1) It maintains low temperatures in plants, (2) it maintains uniform temperatures, (3) it enables rapid conduction of salts through the plants, (4) it makes rapid growth possible because it stimulates photosynthesis, accomplishing this by maintaining low tissue temperatures at which CO_2 is more soluble than at higher temperatures, and (5) it serves as a regulator of nutritional balances within the plant as well as a mechanism for developing resistance in plants growing under unfavorable conditions. Negative evidence is presented in the argument that if transpiration were a detrimental process it is difficult to understand why it had not been eliminated through the course of evolution; instead it appears that as plants developed they favored structures which took increasing advantage of transpiration.—(*Courtesy Biol. Abs.*)

Daily growth of maize, W. E. LOOMIS (*Amer. Jour. Bot., 21 (1934), No. 1, pp. 1–6, figs. 4*).—In this study at the Iowa Experiment Station, the elongation of the central leaf of maize plants 4–8 weeks old was found to depend upon the water supply and upon the temperature. Direct sunlight caused a water deficit in maize plants, even when the roots were liberally supplied with water, and reduced or stopped the elongation of the leaves. Most, if not all, of the inhibiting effect of light upon the growth of maize would seem to be explainable on the basis of water relations.

The elongation of maize was greatly retarded by temperatures of 10° C. and below. As a result of the interaction of moisture and temperature factors, maize grew most rapidly on dull days and in the early evening.—(*Courtesy Biol. Abs.*)

Localization of tannic substances in the ligneous tissue of the chestnut [trans. title], M. QUENDIAC (*Compt. Rend. Acad. Sci. [Paris], 197 (1933), No. 17, pp. 937, 938*).—Tannic substances in the trunk and limbs of a 50-year-old chestnut tree were confined in the sapwood to the medullary rays. In the heart-

wood not only the rays but some of the wood parenchyma cells contained them, and the walls of all the wood elements (cells and vessels) were impregnated with tannic compounds.

Comparative studies of structural and osmotic properties of the needles of different species of Pinus [trans. title] A. GRAHLE (*Jahrb. Wiss. Bot.*, 78 *(1933), No. 2, pp. 203–294, figs. 31*).—There is marked qualitative similarity in pine needle structure in spite of great habitat differences between the species. A quantitative examination was made, for 29 species of *Pinus*, of relative surface, i.e., ratio of total surface in square centimeters to volume in cubic centimeters. Relative surface varied from 30 to 87, the higher figures being mainly for 5-leaved pines. The percentage of assimilatory tissue was greater in 5-leaved pines than in others, while the percentage of conducting tissue was greater in 2-leaved pines. Volume of assimilatory tissue lessens inversely with relative surface. Total stomatal number is low, and per unit of surface greater in 2-leaved pines but less per unit of volume.

In the same species in habitats of increasing severity the relative surface decreases; the volume of needles usually diminishes; the ratio of conducting tissue to total surface increases; and the ratio of assimilatory tissue volume to total surface increases and in the same proportion as the relative surface decreases. The conducting tissue, as percentage of total volume and also of total surface, is greater in species with lesser transpiration. With greater transpiration the total volume of assimilatory tissue is greater (although no relation exists if calculated to total surface), and the stomatal number is greater. No relation exists if the stomatal numbers are calculated per unit area.

The osmotic values were calculated on *P. peuce*, *P. cembra*, *P. strobus*, *P. sylvestris*, *P. montana*, and *P. nigra*. Needles heated for 20 min. at 100° C. were pressed at 300 atmospheres in a Buchner hydraulic press and the freezing point determined by the Bechman thermometer method. Material was collected at the same height on the south side of the specimens. Various samples from the same tree taken under these conditions agreed with an error of 0.3 percent of the mean. Temperature and relative humidity were measured with the Assman psychrometer, and evaporation with a Piche evaporimeter.

Daily changes were followed in *P. montana* and varied with the season. In the vegetative period the maximum osmotic values occurred at about noon and the minimum at night, the march roughly corresponding to the march of transpiration, assimilation, and water deficit. In the winter resting period the day osmotic maximum lay in the afternoon and a second higher maximum at night, possibly a reaction to cold. In the course of the year an osmotic value increase was shown in autumn and winter, with a maximum in the spring (about March) and a rapid fall at growth onset, remaining low during the growing period. Lesser variations occurred among the species examined. Comparison of the annual mean of the osmotic values with the quantitative anatomical results showed that it was most closely related to the elements (conducting and stomatal) associated with the water balance, while the maximum osmotic value was related to the assimilatory tissue. With increasing xeromorphy went decreased osmotic value.

In general, *Pinus* shows a power of maintaining a positive carbohydrate balance while using little water, and the ecology of its assimilation seems of even greater importance than its water balance.—(*Courtesy Biol. Abs.*)

The influence of cations on aerobic sporogenesis in a liquid medium, F. W. FABIAN and C. S. BRYAN (*Jour. Bact.*, *26 (1933), No. 6, pp. 543–558; abs. in Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 202, 203*).—With the object of

determining some of the factors influencing spore formation in bacteria, the investigators used 1 percent peptone, which did not stimulate sporogenesis, and added chlorides of the following in three molalities: Na, K, NH_4, and Li (monovalent); Mg, Mn, Ba, Ca, Pb, and Ni (divalent); Al, Ce, and Fe (trivalent); and Sn (tetravalent). *Bacillus subtilis*, *B. cereus*, *B. mesentericus*, and *B. megatherium* were tested in these solutions. Only the monovalent cations distinctly stimulated sporogenesis, this being most abundant at the point of maximum growth and hence not due either to nutritive lack or to accumulation of metabolic products. Differences in pH between 5.0 and 7.5 had little effect. The influence of molal concentration agrees closely with that determined by other bacteriologists with *Escherichia coli*.

Byssochlamys fulva, sp. nov., M. Olliver and G. Smith (*Jour. Bot. [London], 71 (1933), No. 847, pp. 196, 197, pl. 1*).—A description is given of a new ascomycetous fungus, isolated from canned and bottled fruits, which appears to be fairly wide-spread.

Yeasts found in fermented maple syrup, F. W. Fabian and H. H. Hall (*Zentbl. Bakt. [etc.], 2 Abt., 89 (1933), No. 1–4, pp. 31–47, figs. 7; abs. in Michigan Sta. Quart. Bul., 16 (1934), No. 3, p. 204*).—Fermented maple sirup was analyzed to determine what yeasts caused the fermentation. A large number were isolated and identified. On the basis of morphological, cultural, and physiological characteristics they could be divided into seven groups as follows: *Saccharomyces aceris-sacchari* n.sp., *S. beherensianus*, *Zygosaccharomyces mellis*, *S. monacensis*, *Z. barkeri*, *Z. japonicus*, and *Z. nussbaumeri*. Thermal death point determinations were made of vegetative cells and ascospores in nutrient broth and maple sirup. Vegetative cells were killed in nutrient broth at 55° C. in 5 min. and in maple sirup at 60° in from 5 to 10 min. Ascospores were killed in nutrient broth in most cases at 65° in 5 min. and in maple sirup at 75° in 5 min. The moisture content of freshly-made maple sirup was from 26.3 to 36.5 percent. Samples of fermented maple sirup contained from 32.7 to 34.6 percent moisture.

A study of Rhizobium species in relation to nodule formation on the roots of Florida legumes.—II, W. R. Carroll (*Soil Sci., 37 (1934), No. 3, pp. 227–241, pls. 2*).—Continuing studies previously reported (E.S.R., 68, p. 185), nitrogen fixation experiments indicate that certain strains of nodule bacteria from the cowpea group of host plants are superior to other strains from the same group. The results from immunological tests indicate that a close protein kinship exists among *Crotalaria* species and the cowpea plant, but not between these species and alsike clover and the field pea. The complement fixation and agglutination reactions compare favorably with each other as means of identifying legume nodule bacteria. Because of its simplicity, the agglutination reaction is to be preferred. Group agglutination may be due to the presence in a given leguminous species of an enzyme specific for certain *Rhizobium* species and not for others.—(*Courtesy Biol. Abs.*)

Nitrogen fixation by the endophyte of Lolium, R. Brown (*Jour. Agr. Sci. [England], 23 (1933), No. 4, pp. 527–540, figs. 2*).—Evidence is adduced to show that the free molecular nitrogen supplies part of the nitrogen requirement of *L. perenne*. This species was found growing in soils in which the amount of nitrogen available to the growing plant was small. Plants grown in an atmosphere in which nitrogen was replaced by hydrogen showed signs of nitrogen starvation. The effect of the hydrogen on the plant was tested by growing plants in an atmosphere in which the inert gas was a mixture of nitrogen and hydrogen. The total nitrogen of agar tubes in which the seedling had been growing increased from germination throughout the eight weeks of the

experiment. Definite evidence of fixation was found only in those cases where combined nitrogen was absent from the nutrient medium. The fixation is attributed to the mycorrhizal fungus endophyte.—(*Courtesy Biol. Abs.*)

The effect of ultraviolet light on photosynthesis, W. ARNOLD (*Jour. Gen. Physiol., 17 (1933), No. 2, pp. 135–143, figs. 3*).—The photosynthesis and respiration of *Chlorella pyrenoidosa* were measured in Warburg manometers as functions of the amount of ultraviolet light (2,537 a.u.) applied. No significant change was observed in the rate of respiration. The rate of photosynthesis was found to be decreased by the irradiation. The log survival ratio (rate of photosynthesis after irradiation divided by the rate of photosynthesis before irradiation) plotted against time of irradiation gives a straight line with negative slope. This is taken to mean that one quantum inactivates some unit in the photosynthetic mechanism. No chemical change could be found in the chlorophyll extracted from irradiated cells.—(*Courtesy Biol. Abs.*)

Influence of shorter light rays upon absorption of nitrate by the young wheat plant, W. E. TOTTINGHAM, H. L. STEPHENS, and E. J. LEASE (*Plant Physiol., 9 (1934), No. 1, pp. 127–142, figs. 2*).—In this contribution from the Wisconsin Experiment Station, wheat seedlings 3 weeks of age were exposed to daily radiation periods in chambers under climatic control. Absorption of NO_3 per unit of dry matter was determined as affected by supplementing the common Mazda lamp with the carbon arc, the total intensity being constant. Combined lamps increased the violet to ultraviolet region from 4 to 5 percent.

With the use of a low voltage arc lamp on nitrate-starved plants the results indicated benefit from the radiations of shorter wave length. KNO_3 was superior to $NaNO_3$ as a carrier under both forms of radiation. Elimination of preparatory starvation gave much more positive responses to the carbon arc, as did also modification of the latter to increase rays characteristic of middle solar ultraviolet. With these beneficial modifications the absorptive effect became relatively independent of the basic element accompanying NO_3.—(*Courtesy Biol. Abs.*)

The acidity relations in the epidermal and guard cells of Rumex acetosa in light and darkness [trans. title], J. PEKAREK (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 21 (1933), No. 3, pp. 419–446, figs. 7*).—Surface cells of *R. acetosa* leaves were impregnated with neutral red as a vital stain by means of vacuum infiltration. No injurious effects were observed. In the presence of light, the subsidiary cells and crystal sacs absorb the dye most strongly, adjoining epidermal cells somewhat less, and guard cells and remote epidermal cells least. All show pH about 6. In darkness the guard cells, however, absorb the dye strongly and show increased acidity, while the subsidiary and nearby epidermal cells are alkaline, the crystal sacs remaining as in light.

Application to the work of G. W. Scarth and J. D. Sayre on stomatal movement by colloidal hydration through acidity changes is discussed.—(*Courtesy Biol. Abs.*)

Effect of soft X-rays on germination of wheat seeds, H. M. BENEDICT and H. KERSTEN (*Plant Physiol., 9 (1934), No. 1, pp. 173–178, figs. 6*).—Wheat seeds were irradiated with the characteristic K lines of copper for various lengths of time and sprouted between blotters in the dark for 7 days. The diastatic activity, the reducing sugar content, the respiratory rate, and the percentage of water in the seedlings were determined. Those irradiated for 5 sec. showed an increase in both diastatic activity and reducing sugar content. Those irradiated for a longer period of time showed a decided and progressive decrease in these two substances as well as a progressive decrease in the other quantities measured.—(*Courtesy Biol. Abs.*)

Relations of germinating soybeans to temperature and length of incubation time, T. I. Edwards (*Plant Physiol., 9 (1934), No. 1, pp. 1–30, figs. 6*).—*Soja max* seeds of the Black Eyebrow variety germinated with equal rapidity at 33° and 36.5° C., more slowly at 28.5° and 40°, and still more slowly at 24.5,° as measured in three ways. For Minsoy, Manchu, and Tokyo soybeans 33° was more favorable than 36.5° or 28.5°. The times necessary for germination of individual seeds at each of the five constant temperatures had frequency distributions similar to that of the Gaussian probability curve, and the values for the modes in the Black Eyebrow variety were unchanged by temperature. The removal of germinated seeds at regular intervals during the germination of a seed sample is interpreted as a selective process which sorts seedlings into different physiological classes.—(*Courtesy Biol. Abs.*)

Dormancy in Tilia seeds, L. V. Barton (*Contrib. Boyce Thompson Inst., 6 (1934), No. 1, pp. 69–89, figs. 5*).—Dormancy in seeds of *T. americana* is due to an impermeable seed coat and a partially dormant embryo. The seed coats were rendered permeable by treatment in moist granulated peat moss at 20° C. for 4 mo. An additional 5 mo. at 1° or 5° C. served to afterripen the embryo. This method was applied practically by planting the fruits in flats in June or July and placing the flats in a mulched coldframe during the winter. Inhibition offered by the seed coat was effectively overcome by treating extracted seeds with concentrated sulfuric acid for 20 min. Seeds thus treated gave good seedling production after 3 or 4 mo. at 1° or 5°. Catalase activity and the rate of growth of excised embryos increased with afterripening. Oven tests and sample plantings as well as plantings made directly in flats using seeds of *T. tomentosa*, *T. platyphyllos*, and *T. cordata* indicated the same general trend as *T. americana*. However, *T. tomentosa* germinated very poorly throughout the tests, while *T. platyphyllos* and *T. cordata* germinated more easily and with higher percentages than *T. americana*.—(*Courtesy Biol. Abs.*)

Physiological and chemical changes preceding and during the afterripening of Symphoricarpos racemosus seeds, F. Flemion (*Contrib. Boyce Thompson Inst., 6 (1934), No. 1, pp. 91–102, figs. 2*).—For germination of seeds of *S. racemosus* to take place it is necessary to overcome the inhibiting effect of the seed coat and to bring about complete development and afterripening of the embryo. The former may be accomplished by soaking the seeds for 75 min. in concentrated sulfuric acid or by placing the seeds in a moist medium for 4 mo. at 25° C., during which period the seed coat undergoes destruction by fungi, or by a combination of the sulfuric acid treatment and several weeks at 25°. Seeds kept under moist conditions for 3 or 4 mo. at 25° in the absence of fungi and subsequently placed at 5° for afterripening failed to germinate. The dormancy of the embryo is broken by an afterripening period of 6 mo. in a moist medium at 5°. During this period at 5° the embryo enlarges and increases in moisture content and in catalase and peroxidase activity. While at 25° the activity of these enzymes does not increase, but there is instead a slight decrease.—(*Courtesy Biol. Abs.*)

Cause of seed abortion in soybeans and other crop plants, Z. H. Patel (*Abs. Thesis, Univ. Ill., Urbana, 1933, pp. 8*).—Investigations with eight varieties of soybeans were conducted at Urbana and Toledo, Ill., to determine the cause of seed abortion, which ordinarily ranges from 10 to 40 percent in soybeans and from 15 to 40 percent in cotton. This thesis abstract indicates that the author believes he has demonstrated that neither soil type, fertilizing, nor plant nutrition has any direct influence on seed abortion; that visible plant characters have no relation to this phenomenon; that its amount differs with varieties, or even with the individual plant, and also with season; that soy-

bean ovules are not subject to abortion after they are about one-third grown; that the greatest abortion occurs in those cotton or soybean seeds nearest the base of the lock or pod, respectively; and that seed abortion is caused by the removal of water, together with some soluble material, from the immature seeds through the hilum when moisture in the soil is not sufficient so that the rate of transpiration exceeds the rate of water intake by the plant and the leaves withdraw water from other plant parts.

Drought of abortion-producing severity results in complete cessation of seed growth. Unaborted seeds at the base of the soybean pod were less viable and lighter in weight than those in the pod tip when drought conditions prevailed, but with insufficient intensity or not early enough to result in abortion.

It is suggested that selection for resistance to seed abortion may prove possible if plants are grown under controlled conditions and at the proper stage of ovule susceptibility are subjected to artificial drought conditions. The seeds from plants showing the least resulting abortion are chosen for further propagation.

A method for studying drought resistance in plants, H. L. Shirley (*Science, 79 (1934), No. 2036, pp. 14–16, fig. 1*).—Potted plants were placed in a closed, illuminated chamber at constant temperature. Air dried by $CaCl_2$ was passed through the chamber. The time of survival of the plant was taken as a measure of drought resistance.—(*Courtesy Biol. Abs.*)

Notes on Belling's green-light method for critical microscopy, H. C. Waterman (*Stain Technol., 9 (1934), No. 1, pp. 21, 22*).—The author describes a method of illumination with the use of light filters which gives a much closer approach to monochromatic light than the previously described method of Belling (E.S.R., 67, p. 201). It should be especially valuable in plant cytology.

Preliminary notes on chromic fixation in alcoholic media, H. C. Waterman (*Stain Technol., 9 (1934), No. 1, pp. 23–31*).—Certain chemical difficulties which stand in the way of satisfactory tests on chromium fixation of plant tissues are discussed, and a procedure is described for preparing a chrome-alcohol stock solution in a way which will avoid them.

It is suggested that the properties of OsO_4 most important in the quick-killing effect conferred by it upon aqueous chromic reagents are probably, in addition to its high toxicity, its volatility and its oxidant action. Volatile, toxic oxidants which do not attack alcohol are therefore discussed briefly, with reference especially to their use as quick-killing adjuvants in chrome-alcohol reagents. Iodine is noted as probably the most important inorganic possibility. The quinones are considered highly promising among organic compounds.

Results of fixations of *Vicia faba* root tips in nine variations of the proportions of acetic acid and iodine in a chrome-alcohol-acetic-iodine combination are described. The best adapted chrome-alcohol-iodine reagents preserved some details of the chromosomes better than the Bouin solution, but did not appear to make certain details of the early prophase as clear as does the Benda modification of the Flemming reagent.

An improved method of softening hard woody tissues in hydrofluoric acid under pressure, K. A. Chowdhury (*Ann. Bot. [London], 48 (1934), No. 189, pp. 308–310, fig. 1*).—The use of a pressure cylinder lined with sheet lead and provided with a pressure gauge cut down the time required for softening samples of woods for sectioning to one fourth to one sixth if 80 lb. pressure was maintained instead of none. The time for softening required from 3 to 14 days for 1-in. cubes, depending on the species of wood.

The method of collodion films for stomata, F. L. Long and F. E. Clements (*Amer. Jour. Bot., 21 (1934), No. 1, pp. 7–17, fig. 1*).—Solutions of cellulose

nitrate (collodion) and acetate are found well adapted to studies of the number and distribution of stomata. Variations in number and distribution, as well as in aperture, are most readily and accurately determined by means of miniature quadrats and transects. The advantages of collodion films lie in the rapidity and convenience of operation, applicability to practically all leaf surfaces and textures, and freedom from fragments of mesophyll. Such films possess an exceptional range of application to plant organs and parts, to various types of fossils, and to the hard parts of animals.—*(Courtesy Biol. Abs.)*

An oil drop theory of pollen-grain pattern formation, R. P. WODEHOUSE (*Amer. Jour. Bot., 21 (1934), No. 1, pp. 18–22, figs. 4*).—Upon this theory the pattern exhibited by a certain class of pollen grains is a record of the arrangement of droplets of oil which condensed upon its surface during development.—(*Courtesy Biol. Abs.*)

GENETICS

Chromosome structure in Tradescantiae.—V, Optical analysis of a somatic telophase chromosome, B. R. NEBEL (*New York State Sta. Tech. Bul. 220 (1933), pp. 9, pl. 1, figs. 2*).—As a result of optical analysis through photomicrography and the successive projection of the image of different planes into one and comparison of the object with model glass spirals illustrating the refractive properties of translucent spirals in a relatively less dense medium viewed in transmitted light, the author maintains the existence of four chromonemata in the somatic telophase chromosome of *Tradescantia reflexa* rather than two as previously announced by other investigators. It is suggested that the demonstration of a development from the optically duplicate chromonema of anaphase to the optically quadruplicate chromonema of telophase is progress toward an understanding of the multiplying gene string.

A note on the chromosome numbers in cluster beans, Cyamopsis psoralioides D.C., G. N. R. AYYANGAR and N. KRISHNASWAMY (*Indian Jour. Agr. Sci., 3 (1933), No. 5, pp. 934, 935*).—The chromosomes of the cluster bean (*C. psoralioides*) were seen best in buds fixed between 7 a.m. and 9 a.m. The haploid number counted in pollen mother cells is 7, and the diploid counted in cells of the ovary wall is 14.

Three cases of deficiency in chromosome 9 of Zea mays, H. B. CREIGHTON (*Natl. Acad. Sci. Proc., 20 (1934), No. 2, pp. 111–115, fig. 1*).—Several points of interest with respect to deletions and deficiencies and the three cases of Yg_2 deficiency in which they appeared are discussed from studies at Cornell University. One small deficiency does not affect the functioning of either the male or the female gametes possessing it, while another shows that a truly terminal deletion can occur. All three give evidence of the position of yg_2, i.e., very near the short arm of chromosome 9.

Heritable characters of maize, XLVI, XLVII (*Jour. Heredity, 24 (1933), No. 8, pp. 324–326, fig. 1; 25 (1934), No. 1, pp. 28–32, figs. 3*).—The series (E.S.R., 70, p. 30) is continued.

XLVI. *Liguleless–2*, R. A. Brink.—A new liguleless type (lg_2) of corn appearing in Golden Glow progenies at the Wisconsin Experiment Station closely resembles the liguleless (lg_1) reported by Emerson (E.S.R., 28, p. 231) in the main effects on plant structure. The lg_2 gene lies in the A_1–Rg group about midway between the a_1 and d_1 loci. Crossing over between lg_2 and d_1 was estimated to be about 33 percent.

XLVII. *Branched silkless*, J. H. Kempton.—Branched silkless (*bd*) designates a heritable recessive mature plant character in corn in which the ears are ramified greatly as in ramose, but are completely without silks as in the silkless form described by Jones (E.S.R., 54, p. 630). Breeding tests indicated that only a single gene, distinct from the ramose and silkless genes, is involved in its expression.

Inheritance of pollen colour in Asiatic cottons, V. R. AYYAR and R. BALASUBRAHMANYAN (*Indian Jour. Agr. Sci., 3 (1933), No. 6, pp. 1116–1123, pl. 1*).—Study of the segregation of color of pollen in both intervarietal and interspecific crosses in two Asiatic cottons (*Gossypium obtusifolium* and *G. herbaceum*) revealed that segregation was sharp and clear-cut, and that only one factor is involved in the expression of yellow color. The presence of different modifying factors was not observed even in interspecific crosses. Crosses involving different species having pollen of grade 2.5 (Harland's grading (E.S.R., 65, p. 121; 69, p. 344)) showed neither intensification nor dilution.

The inheritance of 'lintless' in Asiatic cottons, M. AFZAL and J. B. HUTCHINSON (*Indian Jour. Agr. Sci., 3 (1933), No. 6, pp. 1124–1132*).—Two types of lintlessness (hairy and glabrous) found in *Gossypium arboreum* are described, and their genetic behavior is demonstrated. The results obtained were interpreted as being due to the action of the two genes, H^L, lethal in the homozygous condition and giving rise to a hairy lintless type which is rather weak when heterozygous, and h^G, recessive to normal and giving a completely glabrous plant with only a very few short hairs on the seed.

Inheritance of characters in ragi, Eleusine coracana (Gaertn.), the finger millet, VII, VIII (*Indian Jour. Agr. Sci., 3 (1933), No. 6, pp. 1072–1084, pl. 1*).—Two additional papers (E.S.R., 69, p. 29) are presented.

VII. *Fist-like earheads* (pp. 1072–1079), G. N. R. Ayyangar, P. K. Rao, and U. A. Wariar.—The varied elongation of the earheads of ragi was found to be determined by two factors, E_1 and E_2, either of which gives a short head and both give a long head, while when neither is present a very short head is obtained. The factor Q, determining the density of spikelets per centimeter length, results in a crowding and consequent curving of the earheads, leading to the top-curved, in-curved, and fist-like types. Since the number of spikelets in the earheads of ragi is about equal, such crowding naturally reacts on length. In the absence of Q, the corresponding opens are long open, short open, and very short open. Q, E_1, and E_2 were observed to be independent of P, I_1, and I_2 (plant purple pigmentation), B_1, B_2, and S (grain color), and C_x (unripe pericarp color) factors.

VIII. *Earhead colour factors* (pp. 1080–1084), G. N. R. Ayyangar, U. A. Wariar, and G. Ramabhadran.—Two factors, H_1 and H_2, that determine depth of manifestation of purple pigmentation in the glumes of the ragi earhead, may act either alone or together. Their effect in the absence of one or both the I factors is negligible.

Inheritance of grain length in rice (Oryza sativa L.), K. RAMIAH and N. PARTHASARATHI (*Indian Jour. Agr. Sci., 3 (1933), No. 5, pp. 808–819, fig. 1*).—Since previous work (E.S.R., 67, p. 375) showed that the short round type of rice grain was a simple dominant over the long and narrow type, it was surmised that the factor or factors governing grain length might differ from, yet be associated with, those controlling grain shape. In a cross between two narrow types, T.293 long and T.55 short, differing only in length, the inheritance was found of the multiple-factor type, with three factors controlling grain length. Definite positive correlations were found between length of grain and length : breadth ratio, an index of the shape, in the parents and in

the progenies of crosses. Other crosses under study indicated that the inheritance of grain width also is of the multiple-factor type. The factors controlling length and those controlling width seemed to be associated. The effect of environment on grain size is discussed briefly.

The causes of the cytological results obtained in species crosses in wheat, W. P. THOMPSON (*Canad. Jour. Res., 10 (1934), No. 2, pp. 190–198, fig. 1*).—Pregametic, gametic (both male and female), endospermic, and embryonic causes of the absence or low frequency of many chromosomal and genetic types in crosses between 42- and 28-chromosome species of wheat are appraised as to actual effects. The gametic and endospermic influences are such as to reduce the proportion of plants with chromosome combinations intermediate between those of the parents.

Studies in the development of the female gametophyte in some leguminous crop plants of India, B. ROY (*Indian Jour. Agr. Sci., 3 (1933), No. 6, pp. 1098–1107, pls. 8*).—The development of the female gametophyte in the leguminous crop plants *Pachyrhizus angulatus*, *Cajanus indicus*, *Dolichos lablab*, *Pisum sativum*, and *Lathyrus sativus* was studied at Calcutta University.

In all these species the curvature of the ovules is toward the apex of the ovary. The ovules are more or less campylotropous. A hypodermal cell or cells differentiate as the archesporium in *Lathyrus*, while in the other species the archesporium differentiates at the third layer of the nucellus and usually consists of a group of cells. The archesporial cell divides into a primary parietal cell and a megaspore mother cell in *Lathyrus*, but in the other species no parietal cell has been observed, the archesporial cell directly functioning as the megaspore mother cell. As a result of two divisions, the megaspore mother cell produces a tetrad of megaspores. In all the species the innermost (chalazal) megaspore functions as the embryo sac mother cell, while the other three degenerate. As a result of the activity of the functioning megaspore a typical 8-nucleate embryo sac is formed. In the mature embryo sac 3 of the 8 nuclei organize the egg apparatus.

The synergids are more or less beaked in all the species, only those of *Cajanus* possessing well-defined filiform apparatus. Three nuclei at the chalazal end of the embryo sac differentiate as the antipodal cells. The polar nuclei migrate toward each other and fuse to form the primary endosperm nucleus in *Pachyrhizus* and *Cajanus*, while in other species the polars lie side by side or one above the other. The embryo sac absorbs considerably the surrounding nucellar cells in all the species. Sterility of ovules very rarely occurs under natural conditions. The haploid number of chromosomes is 7 in *Pisum* and *Lathyrus* and 11 in *Cajanus* and *Pachyrhizus*.

The inheritance of a yellow-spot character in the bean, M. C. PARKER (*Jour. Heredity, 24 (1933), No. 12, pp. 481–486, figs. 3*).—Results of crossing a chlorophyll-deficient type of bean plant, termed "yellow-spot", with normal green plants indicate that the character yellow-spot (*YY*) may be considered either as a simple Mendelian dominant to normal green (*yy*) or as incompletely dominant. Attempts to transmit the character by leaf rubbing and needle inoculation culture methods and by grafting were unsuccessful.

[Inheritance of sterility in guinea pigs] (*Indiana Sta. Rpt. 1933, p. 16*).—The inheritance of sterility was found to be due to a simple recessive Mendelian character which manifests itself through a hormone secreted by the anterior pituitary gland.

FIELD CROPS

A symposium on "maintaining the efficiency of agronomic research with reduced support through regional organization" (*Jour. Amer. Soc.

Agron., *26* (*1934*), *No. 2*, *pp. 81–106*).—Regional coordination of agronomic research is discussed respectively from the viewpoints of the experiment station director, by L. E. Call (pp. 81–88), the crops investigator, by H. K. Hayes (pp. 88–93), and the soils investigator, by R. M. Salter (pp. 94–106).

Tables for calculating the standard error and the probable error of the coefficient of variability, H. M. Brown (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 1*, *pp. 65–69*).—This is a contribution from the Michigan Experiment Station.

[Field crops work in Indiana] (*Indiana Sta. Rpt. 1933*, *pp. 11–15*, *49*, *54*, *57*, *59*, *figs. 3*).—Experiments with field crops (E.S.R., 69, p. 37) for which progress is reported briefly included breeding work with wheat and soybeans; seeding tests with alfalfa and clover on droughty soil; cutting tests with alfalfa; comparison of dry v. wet inoculants for legumes; a fertilizer placement test with corn; trials of fertilizers and planting dates for corn as possible aids in control of European corn borer; studies of the effects of fertilizer on the yield, composition, and quality of wheat; milling and baking tests with soft winter wheat varieties; liming tests with sweetclover; fertilized crop rotations; soil fertility studies, including studies with eroded soils; pasture improvement; and control of wild garlic in winter wheat.

[Field crops work in Michigan] (*Michigan Sta. Rpt. 1933*, *pp. 235–237*).—Summary accounts are given on the behavior of Bald Rock wheat, and Katahdin, Chippewa, and Gold potatoes; the progress of breeding work with corn resistant to European corn borer, field beans immune from mosaic, potatoes, and mint; experiments with emergency, permanent, and poultry pastures; trials of lespedeza varieties for pasture; curing tests with alfalfa; and trials of cereal and legume nurse crops.

[Agronomic experiments in New Mexico] (*New Mexico Sta. Rpt. 1933*, *pp. 18–25*, *25–28*, *33–35*, *45*, *46*, *61*, *62*, *fig. 1*).—Research with field crops (E.S.R., 69, p. 200), reported on briefly from the station and from outlying fields near Clayton, Capulin, and Mosquero, embraced variety tests with winter- and spring-sown wheat, oats, barley, corn, grain sorghum, sorgo, cotton, potatoes, sugar beets, alfalfa, soybeans, cowpeas, field beans, millet, and miscellaneous silage and hay crops; breeding work and biometrical studies and spacing and topping tests with cotton; fertilizer trials with cotton and alfalfa; irrigation tests with potato varieties; studies of the annual production of sugar beet seed, involving method, rate, and date of planting; application of various fertilizers and manure; rate of irrigation; studies of the curly top disease of sugar beets; investigation of factors affecting growth and germination of chamiza (*Atriplex canescens*), winter fat (*Eurotia lanata*), and *Valota saccharata;* trials of range plants; adaptation of grasses and Ladak alfalfa for range improvement; germination tests of seed of range forage plants; determination of the protein and moisture content of samples of New Mexico wheat grown on dry land and under irrigation; and control of Johnson grass by chemical sprays. Certain lines of work were in cooperation with the U.S. Department of Agriculture.

[Experiments with field crops in Washington], O. E. Barbee, O. A. Vogel, E. G. Schafer, E. F. Gaines, A. M. Schlehuber, A. L. Hafenrichter, H. M. Wanser, and H. P. Singleton (*Washington Sta. Bul. 291* (*1934*), *pp. 11–13*, *14*, *15*, *46–48*, *50–53*).—Agronomic research (E.S.R., 68, p. 754), carried on at the station and substations and in certain lines in cooperation with the U.S. Department of Agriculture, and reviewed as heretofore, included variety tests with spring and winter wheat and barley, oats, rye, corn, alfalfa, sweetclover, and sunflowers; trials of perennial grasses for forage and erosion control; breed-

ing work with wheat for bunt resistance and yield and with corn; inheritance studies with wheat and rye; cultural (including planting) experiments with winter and spring wheat and flax; fertilizer tests with alfalfa and with potatoes, corn, and wheat in rotation; crop rotations; study of competition between alfalfa and sweetclover and cereals and grasses as companion crops; control of bindweed with chlorates; and pasture studies.

Native vegetation in the prairie hay district of north central Nebraska, A. L. Frolik and F. D. Keim (*Ecology, 14 (1933), No. 3, pp. 298–305*).—The variations in structure and yield of the native vegetation as affected by depth of the ground-water table are shown, and typical illustrations of several plant communities contributing to the production of prairie hay are presented in this contribution from the Nebraska Experiment Station. The existence of a number of distinctive plant communities is due largely to two variable factors, the ground-water table and the soil texture. See also an earlier note (E.S.R., 67, p. 125).

Iarovization in field practice, J. H. Martin (*U.S. Dept. Agr., Bur. Plant Indus., 1934, pp. 13*).—*Iarovization or vernalization* (*E.S.R., 70, p. 166*), a method of treating seed of winter cereals so they may mature from spring sowing and of treating seed of spring cereals and certain other spring crops to accelerate reproduction and maturity, has recently been reported to be used widely in Russia. The present discussion calls attention to certain difficulties and limitations in the practical application of the method, reports the results of early trials of iarovization in the United States, presents comparative yields of "naturally iarovized" winter wheat and of untreated spring wheat, and points out that the high temperature treatment failed to produce the responses claimed by proponents of iarovization in crops such as sorghums.

No direct evidence regarding the practical value of the practice appeared to be available in the United States. Sixty-two available comparisons of the yield of "naturally iarovized" winter wheat, and of spring wheat seeded in the spring, showed that the latter produced the higher average yields. Iarovized sorghum seed failed to produce earlier heading or better growth than untreated seed of the same varieties in experiments conducted in 1933.

Twenty-eight pertinent references are included.

Vernalization: A new method of shortening the vegetative period of plants, N. von Gescher (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Roma], 24 (1933), No. 10, pp. 410–416*).—A résumé of current research.

The effect of growing corn and soybeans in combination on the percentage of dry matter in the two crops, R. G. Wiggans (*Jour. Amer. Soc. Agron., 26 (1934), No. 1, pp. 59–65*).—During [New York] Cornell Experiment Station experiments largely noted earlier (E.S.R., 69, p. 202), study of many shrinkage samples, 1923–28 in particular, revealed that the percentage of total dry matter in corn grown with soybeans is not changed significantly, but the percentage of dry shelled grain in the total dry matter is significantly reduced. The percentage of total dry matter in soybeans grown with corn v. when grown alone depended on the season, and very probably on other factors such as available nitrogen and phosphorus and available water.

Turkestan alfalfa as compared with Grimm for wilt-infected soils in Iowa, F. S. Wilkins and H. L. Westover (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 213–222*).—Consideration of the comparative yields, duration of stands, resistance to bacterial wilt (*Phytomonas insidiosa*), and cold endurance of different alfalfa varieties, in tests (1926–32) by the Iowa Experiment Station cooperating with the U.S. Department of Agriculture, led to the conclusion that the choice of varieties for wilt-infected soils in Iowa appears

to lie between Cossack, Grimm, Dakota, or Montana common for short rotations and Turkistan, Hardistan, and Ladak for long rotations, while for soils not infected with bacterial wilt farmers may well continue to use the variegated alfalfas. Considerable agronomic information on Grimm and Turkistan is included.

The effect of the time of cutting and of winter protection on the reduction of stands in Kansas common, Grimm, and Turkestan alfalfas, C. O. GRANDFIELD (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 179–188*).—Kansas common, Grimm, and Turkistan (F.C.I. 2674) alfalfas were compared at the Kansas Experiment Station in cooperation with the U.S. Department of Agriculture in an experiment which included variations in the number of cuttings, in the stage of bloom at cutting, winter protection afforded by varying the amount of growth left uncut in the field, and in the length of time between the last cutting and the time growth ceased in the fall. Review of earlier literature indicated that time of cutting, stage of bloom at which cutting was done, winterkilling, and diseases are important factors in reducing stands of alfalfa, and these experiments indicated varietal differences in respect to resistance to cold and wilt.

Loss of alfalfa plants in this experiment was attributed to normal loss from crowding, bacterial wilt, and winterkilling. The normal loss of plants from crowding seemed to become less each year as the stands became thinner. Winter protection aided materially in maintaining stands of Kansas common and Grimm and only slightly in the Turkistan, the most cold-resistant. The amount of bacterial wilt found in the plats evidently was not affected by winter protection. Protection afforded by a 40-day growing period after the last cutting was removed aided in maintaining the stands of alfalfa. Cutting the crop in the bud stage throughout the season or keeping it clipped through the fall growing season brought about depletion in the stands more rapidly than the other treatments. Turkistan proved to be more wilt and cold resistant and could withstand the more severe treatments better than either Kansas common or Grimm.

Seed corn treatments in Arkansas, C. K. MCCLELLAND and V. H. YOUNG (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 189–195*).—Experiments at the Arkansas Experiment Station, wherein the effects of applying a number of organic mercury compounds on stands and yields of corn were observed, gave results indicating that under the test conditions no assured benefit could be obtained as a result of dust treatment of seed corn.

Methods of estimating the performance of double crosses in corn, M. T. JENKINS (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 199–204, figs. 4*).—Data are given from an Iowa Experiment Station study in cooperation with the U.S. Department of Agriculture on four methods of estimating the performance of double crosses in corn. Three methods utilize information on the single crosses of the parents and probably represent the methods of estimation in most common use, while the fourth utilizes only the information from the inbred-variety crosses of the parents. See also an earlier note (E.S.R., 68, p. 32). When the actual performance of 42 double crosses was compared with the estimates of their performance obtained from information on the single crosses among their parental lines and on the inbred-variety crosses of the parental lines, the data from inbred-variety crosses appeared nearly as reliable for estimating the yields of double crosses within a single season as are the more extensive data from the comparison of the larger numbers of single crosses.

The loss in yield that may be expected from planting second generation double-crossed seed corn, F. D. RICHEY, G. H. STRINGFIELD, and G. F. SPRAGUE

(*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 3*, *pp. 196–199*).—In comparative tests by the U.S. Department of Agriculture cooperating with the Ohio Experiment Station, the acre yields of the F_2 generation of 10 double crosses among selfed lines of corn were from 4 to 19.9 bu., or from 5 to 24 percent less than those of the F_1 generation of the same crosses, with an average decrease of 12.1 (standard error=1.5) bu., or 15.2 percent. The authors estimated that the value of such a loss would more than compensate for the cost of F_1 seed, even at current prices (1933). The variation in the size of the decrease was highly significant statistically, the larger decreases tending to occur among the higher yielding F_1 crosses.

Earliness in northern corn as affected by phosphate fertilizers, manure, and other soil treatments, P. J. Olson and H. L. Walster (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 3*, *pp. 205–213*).—Corn (Minnesota No. 13), grown from 1924 to 1932 at the North Dakota Experiment Station on Fargo clay in the 4-year rotation, corn, wheat, oats, and clover, variously received acre treatments of manure (9–12 tons) alone, and with additions of superphosphate (150 lb.), limestone (0.5 ton), and potassium sulfate (150 lb.), and was studied as to comparative maturity under treatment.

Phosphorus advanced maturity significantly. When the date on which plants silked in the various plats was determined, 1928–30, it was found that phosphorus had advanced silking about 2 days, and the combination of manure and phosphorus about 3 days. Lime or potassium did not influence maturity consistently, although manure advanced maturity somewhat. The correlation between yield rank and maturity rank was low. While the increased maturity of the crop was not sufficient in degree to warrant by itself the application of phosphorus, the increased yield of corn, wheat, and oats, all credited to phosphorus, apparently was enough to cover the cost of application. The enhanced maturity, therefore, essentially represented the margin of profit from the soil treatment.

The use of small amounts of nitrogen for corn in addition to phosphorus and potassium, S. R. Miles (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 2*, *pp. 129–137*, *fig. 1*).—The prevalent practice of using complete fertilizers for corn was compared with the use of similar fertilizers omitting the nitrogen. The fertilizers were applied in the rows or near the hills at planting time at rates supplying only from 2 to 6 lb. of nitrogen per acre in 23 experiments of from 1 to 9 years' duration on most of the important corn soils in Indiana, and permitting 261 comparisons of PK with NPK fertilizers.

The nitrogen resulted in an average significant decrease in yield of 1.8 bu. of corn per acre. Nitrogen used at planting appeared to have decreased the corn yield largely or entirely, regardless of season, soil texture, the yield levels, the use of manure for the corn, side dressings with sodium nitrate during the growing season, or whether 2, 3, 4, or 6 lb. of nitrogen were applied at planting. When the corn followed clover or alfalfa, the nitrogen effect was somewhat more favorable or less unfavorable than otherwise. Where the effects of small and larger amounts of nitrogen were compared, an average of 3 lb. of nitrogen reduced the yield 1.8 bu., while an average of 9 lb. increased the yield 2.5 bu. compared with PK only. Organic nitrogen carriers seemed to be slightly superior to inorganic carriers. Early growth of corn was hastened considerably by phosphate-potash fertilizers, but the addition of nitrogen produced only a relatively small further increase in early height and had little or no effect in hastening maturity.

A study of lint and seed development in cotton as influenced by environmental factors, D. G. Sturkie (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 1*, *pp.*

1–24, figs. 5).—The influence of soil type, climatic conditions, and soil moisture on the development of lint and seed in cotton was studied at the Alabama Experiment Station. Plants of Mexican Big Boll were grown on Norfolk sandy loam from Auburn, Ala., and Deer Creek loam, a deep fertile alluvial soil from Stoneville, Miss., in galvanized iron cans to study the influence of soil type. Field-grown plants, protected against rainfall and irrigated at different intervals, were used for studying climatic and soil moisture responses. The length of lint, weight of boll, number of seeds, weight per seed, weight of lint per seed and per unit weight of seed, and percentage of lint were determined for each boll.

Neither soil type, temperature, humidity, nor evaporation appeared to affect any of the characters studied. The amount of available moisture in the soil affected length of lint markedly, a low moisture content resulting in a short lint. The critical period in elongation of lint was about 16 days, beginning on the date of blooming. The length of lint could be shortened at least 3 mm (⅛ in.) by reducing the soil moisture to a critical point. A certain minimum and maximum length of lint for this strain of cotton was apparent.

The weights per boll, per seed, and of lint per seed, and the lint index were reduced by lack of soil moisture, and the percentage of lint and weight of lint per unit weight of seed were increased by a deficiency in soil moisture, the critical period for these characters extending from 1 to 42 days after blooming. Lint percentage varied less with soil moisture changes than did the lint index. The number of seed per boll did not depend markedly on environmental conditions, yet the number tended to be reduced by extreme drought. A heavy boll was due largely to an increase in the weight per seed and weight of lint per seed. Favorable soil moisture conditions produced heavy bolls with a long lint, heavy seed, large lint index, and low percentage of lint.

Relation of the quality of cotton planting seed to length of staple, J. H. Moore (*North Carolina Sta. Bul. 296 (1934), pp. 4, figs. 2*).—Continued research (E.S.R., 66, p. 327) in cooperation with the U.S. Department of Agriculture confirmed observations noted earlier, showing that pure and improved seedstocks are the predominant factor in the production of uniform $\frac{15}{16}$ to $1\frac{1}{16}$-in. staple, and that mixed, run-down, and unimproved seedstocks largely are responsible for the production of staple poor in quality. Improved seedstocks were giving larger yields under farm conditions than the unimproved or mixed stocks. Staple-length distribution in percentage of total bales ginned in North Carolina to December 1 in the 1933 seasons also supported the above conclusions. Field and laboratory studies of 9,088 bales grown on 570 farms in 15 communities indicated that 2,538 bales came from pure improved varieties, 3,313 from improved varieties later slightly mixed with inferior sorts, and 3,237 bales from run-down and short-staple varieties, indicating that much more superior seed must be planted for marked improvement. The home market for North Carolina cotton (E.S.R., 69, p. 455) and suitable varieties for various regions of the State (E.S.R., 69, p. 203) have been discussed earlier.

Groundnut as a rotation crop with cotton, D. N. Mahta and D. L. Janoria (*Indian Jour. Agr. Sci., 3 (1933), No. 5, pp. 917–932, fig. 1*).—Growing peanuts and cotton in alternate years, and the rotations, cotton, sorghum, peanuts, and cotton, cotton, sorghum, peanuts, outyielded other crop sequences in yields of seed cotton. The cotton, sorghum, peanut rotation was the most profitable.

Select varieties of cotton, S. H. Essary (*Tennessee Sta. Circ. 47 (1934), pp. 3*).—Cotton varietal trials from 1928 to 1932 in east, middle, and west Tennessee indicate Stoneville No. 2, D. & P.L. 4–8, and Acala 44 for general planting in the State. Cleveland 884 can be recommended for the warmer parts of Tennessee, and Trice where earliness is of prime importance.

Varietal differences in cotton boll shedding as correlated with osmotic pressure of expressed tissue fluids, R. S. Hawkins, S. P. Clark, G. H. Serviss, and C. A. Hobart (*Jour. Agr. Res.* [U.S.], *48* (*1934*), *No. 2, pp. 149–156, figs. 7*).—The shedding of young Acala cotton bolls was observed in Arizona Experiment Station studies to be correlated definitely with the osmotic pressures of the expressed tissue fluids of the leaves and day-old bolls, confirming results noted previously (E.S.R., 69, p. 42). Daily changes in boll shedding and osmotic pressures showed no correlation in the Pima variety, possibly because of the extremely low shedding coupled with comparatively high osmotic pressures. The spread between the osmotic pressures in the leaves and in the bolls did not seem to be correlated with shedding. Superimposed shedding curves of four varieties differing widely in shedding behavior, Pima, Acala, F_1 of Pima × Acala, and Sacaton Aboriginal, showed a reverse arrangement as compared with the superimposed curves showing osmotic pressures in the bolls, indicating a good negative correlation between shedding and osmotic pressure in the bolls. Boll shedding appeared to be correlated somewhat more closely with osmotic pressure in the bolls than with osmotic pressure in the leaves.

Fruiting characters and time and cost of picking cotton varieties, G. A. Hale (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 1, pp. 38–43*).—Harvesting studies, made during the period 1930–32 on 16 varieties tested for yield in the regular cotton varietal experiment at the Georgia Experiment Station, demonstrated that the group of varieties with short lint and high lint percentages had a shorter picking time and a lower harvesting cost per bale of lint than the group with long lint and low lint percentages. Large-boll varieties with a small number of bolls per bale of lint required a very much shorter time to pick the seed cotton and a significantly lower harvesting cost per bale of lint than the medium- and small-boll varieties with many bolls per bale. The number of bolls picked per hour for the 16 varieties was correlated negatively with the number of pounds of seed cotton picked per hour and with the cost of picking the lint. The time required to pick a bale of lint was correlated highly and positively with the time required to pick 100 lb. of seed cotton, and the cost of picking the lint was correlated highly and positively with the time required to pick the seed cotton on an hour basis but not on a seed cotton basis.

A note on the wax content of Indian cottons with special reference to their feel, N. Ahmad and D. L. Sen (*Indian Cent. Cotton Com.* [*Bombay*], *Technol. Bul., Ser. B, No. 18* (*1933*), *pp.* [*2*]+*6*).—The wax occurring on cotton fiber is present in extremely small quantities, yet it is an important factor in the spinning, wetting, dyeing, and scouring processes, and it also has a direct bearing on its feel as estimated by a grader. Determinations of the wax content of 11 Indian and 1 non-Indian cottons, made principally with a view to correlating it with its degree of silkiness or harshness, showed that the wax content of Indian cottons may range from 0.229 percent to 0.468 percent, that exotic varieties grown in India on the whole exceed the indigenous types in this respect, and that the subjective estimates of the feel of a cotton made by different graders may disagree among themselves and with the results of the wax determination tests. A tentative scale suggested in which the degree of silkiness of a cotton is expressed in terms of its wax content is as follows: Very silky above 0.5 percent, silky 0.425–0.5, slightly silky 0.35–0.425, roughish 0.3–0.35, and rough below 0.3 percent.

Potash starvation and the cotton plant, R. C. Wood (*Empire Cotton Growing Rev.*, *11* (*1934*), *No. 1, pp. 25–29*).—Seed cotton yields from plots at the Imperial College of Tropical Agriculture, Trinidad, which showed definite symptoms of potash deficiency were very much lower than from plots which

had received potash in the fertilizer. The lint was also shorter, more irregular, and contained a larger proportion of poorly thickened hairs.

The influence of time of cutting on the growth, yield, and composition of tropical fodder grasses.—I, Elephant grass (Pennisetum purpureum), D. D. PATERSON (*Jour. Agr. Sci.* [*England*], *23* (*1933*), *No. 4, pp. 615–641, figs. 4*).—Elephant grass, 4 mo. after planting at Trinidad, British West Indies, was cut (A) every 4 weeks, (B) every 8 weeks, and (C) every 12 weeks, during 1 yr. Tillers in the respective series averaged 1.5-2 ft., 3-3.5 ft., and 4.5-5.5 ft. in height at cutting.

Within the 12-week cutting rotation, the longer the interval between crops the higher was the yield per acre both of green herbage and of dry matter. There were distinct signs that cropping as often as every 4 weeks affects the vitality of the grass, produces a smaller root system and a less virile stool, and ultimately leads to a high mortality in the individual stools. A definite increase occurred from (A) to (B) to (C) in dry matter and crude-fiber percentage in the produce, and an equally distinct fall in the protein and mineral percentage. In nutritive value the average grade of green fodder was roughly equivalent to medium quality meadow hay ready for harvest. A definite correlation existed between monthly precipitation and composition of the herbage. The dry matter, crude protein, and ash percentages all varied inversely with the rainfall, while crude fiber tended to increase during the wet season. The mineral content of the produce from all series appeared to be adequate, except in calcium. The 3-mo. cropping rotation seemed to have distinct advantages over the more frequent cutting systems.

Flax: A new cash grain crop for New Jersey, H. B. SPRAGUE (*New Jersey Stas. Circ. 295* (*1934*), *pp. 4*).—Comparative tests in the period 1928–33 showed seed flax to compare very favorably with other spring grains in New Jersey, being surpassed in value only by winter wheat, and in quality (oil content and iodine number) its seed equaled that grown under similar conditions in seed flax States. Uses of the crop and its byproducts are noted briefly.

Studies in Indian pulses.—VI, The root systems of green and black grams, R. D. BOSE and R. G. JOGLEKAR (*Indian Jour. Agr. Sci.*, *3* (*1933*), *No. 6, pp. 1045–1056, pls. 2*).—The series (E.S.R., 69, p. 795) is continued.

The root systems of 40 types of mung or green gram and 25 types of urid or black gram, isolated at Pusa, were studied, and their relationship with certain other characters determined. In both crops there were observed mesophytic root systems, with secondary roots horizontal and developing abundantly up to a depth of about 4.5 to 6.5 in., with tertiary or fibrous roots poorly or well developed, and xerophytic root systems, with secondary roots oblique and developing mostly from the upper 5 to 7 or 7.5 to 12 in. of the tap root, with tertiary or fibrous roots poorly or well developed. The maximum depth of the main tap root was greater in xerophytic than in mesophytic types of both crops, but urid generally had a distinctly deeper root penetration than mung. Types coming from the alluviums invariably had a mesophytic type of root system, whereas types originating from seed collected from drier localities possessed the xerophytic type. All early-maturing forms had a shallow working depth of roots, while all late-maturing types had a deeper working depth, and types medium in maturity were also intermediate in this character. The lateral spread of secondary roots was much greater in the mesophytic than in the xerophytic types. Types with a spreading habit of the plants had a greater lateral spread of the roots than those with erect or semierect plants.

Observations of Korean lespedeza plantings in southern Michigan, G. F. WARREN (*Michigan Sta. Quart. Bul.*, *16* (*1934*), *No. 3, pp. 173, 174*).—Results of demonstrations in 10 counties in southern Michigan, on a wide range of soil

conditions with Tennessee-grown seed, suggested that the present type of Korean lespedeza, which has proved of value as a forage and pasture crop on sour soils of States farther south, apparently is of little worth in Michigan.

Mangel beets for the poultry farm, H. B. Sprague (*New Jersey Stas. Circ. 293 (1934), pp. 4*).—Varieties, soils, tillage, fertilizer, and cultural methods, and harvest and storage practices are indicated in brief for growing mangels for poultry in New Jersey. The Mammoth Long Red variety proved most productive in station tests in 1928–32. Feeding recommendations for laying flocks are outlined, with remarks on the feeding value of mangels.

Early planting of oats advisable in Upper Peninsula, B. R. Churchill (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 188–190*).—Experiments at Chatham indicate for similar parts of the Upper Peninsula the early planting of an early maturing oats, such as Iogold.

Studies in Indian oats, F. J. F. Shaw and R. D. Bose (*Indian Jour. Agr. Sci., 3 (1933), No. 5, pp. 754–807, pls. 4, figs. 8*).—Two contributions begin the series.

I. *The improvement of the crop by selection and the acclimatization of exotic types* (pp. 754–770).—An account is given of the types grown in India, selections made at Pusa, introductions and hybrids, and the agronomic characters of B.S. 1 and 2 early, high-yielding, and drought-resistant types, selected at Pusa from Bihar oats. Indian oats pertain to *Avena sterilis culta* (*A. byzantina*) and not to *A. sativa*. Many European and American oats tested at Pusa were much too late for grain, although ideal for green forage.

II. *Inheritance of some characters in interspecific crosses between Avena sativa L. and A. sterilis L. var. culta* (pp. 771–807).—Certain characters were studied in the crosses, I, Scotch Potato (*A. sativa*) × B.S. 4 (*A. sterilis*); II, Scotch Potato × B.S. 2 (*A. sterilis*); and III, Abundance (*A. sativa*) × B.S. 4. Scotch Potato and Abundance oats possess an *A. sativa* type of base, and the B.S. oats have an *A. sterilis* type. Single factor differences were observed between the *A. sativa* and *A. sterilis* types of base, strong and weak awns, and long and short basal hairs. Two factors were found responsible for the inheritance of basal hairs and hairs on the margin of leaves. Transgressive segregations indicating presence of multiple factors were observed in the inheritance of height of plants in all three crosses, number of days taken to head out, and number of spikelets per panicle in crosses I and II, while in cross III dominance of early-maturing plants and plants with a low spikelet number were noted.

The relative growth rate, the carbohydrate contents, and the yield of the rice plant (Oryza sativa L.) under different treatments, R. H. Dastur and A. R. Pirzada (*Indian Jour. Agr. Sci., 3 (1933), No. 6, pp. 963–1012, figs. 13*).—Continued studies (E.S.R., 69, p. 796), were made with Columbia No. 42 rice transplanted in July onto beds variously receiving potassium nitrate, ammonium sulfate, or a mixture of the two on August 1 and 15, September 1 and 15, and October 1.

The relative growth rate of the rice plant and of its leaves and the leaf area ratio reached their maxima in August. The mixture of nitrate and ammoniacal nitrogen was the best, as the growth rate of the plants at any stage of fertilizing exceeded the growth rate of the plants receiving either nitrate or ammoniacal nitrogen alone, and the dry weights of the straw and weights of the grain of the plants followed the same trend. The increase in growth rate and the grain yield of plants fertilized on October 1 (i.e., flowering stage) was negligible compared with those of unfertilized plants. The maximum carbohydrate contents occurred in plants fertilized with the nitrogen mixture

on August 15. Indications were that the mixture of two forms of nitrogen is a better fertilizer than any form used alone, and that the plants should be fertilized early in August or even at transplantation. Late fertilizing had very little effect on the growth and yield of the rice plants.

Types of Sesamum indicum D.C. in the Punjab, A. Mohammad and Z. Alam (*Indian Jour. Agr. Sci., 3 (1933), No. 5, pp. 897–911, pls. 3*).—Thirty-four types of sesamum collected in Punjab are described and classified, together with a determinative key and remarks on the economic status of the crop. See also earlier notes by Zaitsev (E.S.R., 53, p. 36), Ram (E.S.R., 65, p. 530), and Rhind and Thein (E.S.R., 70, p. 472).

Saccharum spontaneum L.—A comparative study of the forms grown at the Imperial Sugarcane Breeding Station, Coimbatore, R. R. Panje (*Indian Jour. Agr. Sci., 3 (1933), No. 6, pp. 1013–1044, pl. 1, figs. 6*).—The 12 forms of *S. spontaneum* under study are described and classified, with a determinative key and remarks on the worth of the various characters in tracing toxonomic relationships.

A biometrical analysis of yield trials with timothy varieties, using rod rows, H. F. Smith and C. H. Myers (*Jour. Amer. Soc. Agron., 26 (1934), No. 2, pp. 117–128*).—The results of a varietal yield trial with 39 timothy varieties sown in rod rows in September 1923 and harvested in 3 yr., 1925–27, are reported from Cornell University. Except for three sorts from Aberystwyth, Wales, which gave the greatest yields in 1925 and the lowest subsequently, the relative yields of varieties were similar in all 3 yr.

Twelve of the 39 varieties were also grown in other trials sown in 1920, one using rod rows and harvested over 5 yr., 1921–25, and the other using broadcast plats, 16.5 by 49.5 ft., and harvested in 3 yr., 1921–23. Yields of these 12 varieties agreed fairly closely in all three trials. The rod rows showed least variability in the second and third harvest years, when the standard error for a single row was about 9 percent. A recommendation is that in rod-row trials of timothy only the yields in these 2 yr. should be recorded unless ability to maintain yields in subsequent years is sought. The error observed for the broadcast plats was 8 percent in the first year and about 20 percent in the second and third years.

The rod-row trial sown in 1923 had 10 replications of each variety, and the effects of soil heterogeneity were extremely marked because the long narrow plats (rod rows) lay along, instead of across, the fertility gradient, and because of systematic arrangement of replications and mean yields of varieties were not directly comparable. The position was, however, retrievable by the use of check plats in every fifth row. Reasons are presented for the application of Fisher's analysis of variance to yields adjusted by relation to the checks.

The production of timothy pollen, M. W. Evans (*Amer. Jour. Bot., 21 (1934), No. 1, pp. 34–41, figs. 2*).—Timothy pollen extracts are used for the treatment of hay fever in patients who are susceptible to this pollen. In the latitude of northern Ohio, timothy florets bloom in largest numbers in ordinary timothy meadows from about June 25 to July 5, the season being somewhat earlier south and later north of this latitude. The pollen may be collected by harvesting stems on afternoons during the flowering season and placing the heads over paper where the florets usually bloom on the following morning, and the pollen may be shaken off.

In experiments in 1926–27 by the Ohio Experiment Station and the U.S. Department of Agriculture cooperating, pollen yields were increased by sodium nitrate, the percentage increase in the yields of pollen resulting from such

treatments being more than double the corresponding increase in hay yields. The most pollen usually is produced on fair days when the temperature is about normal or above, and when there is a relatively high percentage of sunshine. In favorable weather, blooming occurs at about the same time each day during the flowering season until completed, but when the weather becomes cloudy and rainfall occurs, and especially if the temperature becomes subnormal, blooming may be suppressed for one or even two days, although when favorable weather returns the florets bloom profusely. By growing early and late varieties, the timothy pollen collection period may be extended about two weeks longer than for ordinary timothy.

Border effect in irrigated plots of Marquis wheat receiving water at different times, D. W. ROBERTSON and D. KOONCE (*Jour. Agr. Res.* [*U.S*], *48* (*1934*), *No. 2, pp. 157–166, figs. 2*).—Marquis wheat planted at the Colorado Experiment Station with a 16-disk drill in 1928–31, inclusive, received 7 in. of irrigation water in the fall, or at germination, or 1 in. at germination plus 6 in. at jointing. Certain plats also received the seasonal rainfall, while others were covered as in earlier studies (E.S.R., 57, p. 132) so as to receive only the irrigation water. The plats, triplicated and distributed systematically, were cut to 10-ft. lengths at harvest, and outside rows, 1 and 16, were harvested separately; rows 2 and 15 and 3 and 14 were harvested similarly; and rows 4 to 13, inclusive, were harvested together, comprising the 10 center rows.

The yield rose as the size of the plat was increased, but the percentage increase was uniform for the three treatments employed. Although the average yearly yields varied, the border effect remained uniform with the exception of the outside rows, 1 and 16. In 1931, a very dry year, less border effect was found from the outside rows. The variation as determined by the percentage of probable error did not increase or decrease for plats of different sizes. It varied in different years with the different number of border rows. The variation was similar for yields of both grain and straw. When the same amount of irrigation water was applied to the wheat at different times, the comparable yields were the same for plats of 10 rows and for 10 plus 2, 4, or 6 border rows, while the difference in the average yield between the plats irrigated in the fall and those irrigated at germination was not significant for plats of 10, 12, 14, or 16 rows, the difference in average yield between fall irrigated plats and those irrigated at jointing was significant for plats of 10, 12, 14, or 16 rows. The results indicated that comparable results could be obtained from irrigated plats whether the border is removed or whether it is included in the yields.

Similar results were obtained with the covered plats.

Studies on the technic of control hardiness tests with winter wheat, A. ANDERSON and T. A. KIESSELBACH (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 1, pp. 44–50*).—The technic in controlled cold endurance tests with winter wheat used in a wheat breeding project (E.S.R., 65, p. 346) and involving control equipment described by Peltier (E.S.R., 66, p. 21), is discussed in respect to use of field hardened plants, varieties, field hardening temperatures, manner and extent of controlled freezing, testing vitality after freezing, effect of degree of hardening, effect of rapidity of soil temperature changes upon survival, and correspondence of controlled and field hardiness tests. In part these tests correspond with those reported for alfalfa by Peltier and Tysdal (E.S.R., 67, p. 379).

Cold resistance adjustments of field-hardened winter wheats as determined by artificial freezing, C. A. SUNESON and G. L. PELTIER (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 1, pp. 50–58*).—The progressive actual and changing

relative cold tolerance relationships of two winter wheat varieties (seedlings grown and hardened in flats under field conditions before artificial freezing) from November to January in 1930–31, and of four varieties from November to April in 1931–32, are described from Nebraska Experiment Station studies made in cooperation with the U.S. Department of Agriculture. The chamber described by Peltier (E.S.R., 66, p. 21) was used in freezing.

An increase in hardening, as expressed in the ability of wheats to endure lower temperatures, was shown from November to January, followed by a nearly equal recession in hardiness from January to late March. The marked and statistically significant changes in the relative hardiness rank of the varieties Blackhull, Kawvale, Nebraska No. 60, and Minturki, noted during the winter, were attributed to hardening adjustments. While exposure to severe temperatures was essential for maximum expressions of cold tolerance, exposures to specific hardening temperatures did not always result in the same hardiness relationships, suggesting an important role for other environmental and seasonal factors in the hardening phenomenon. It is pointed out that the demonstration of changing relative varietal relationships under a field environment may permit an explanation of the fairly frequent abnormalities associated with localized field trials and may account for some of the inconsistencies experienced in laboratory evaluations with field plants.

The baking value of wheats of Morocco in 1932, E. Miège (*La valeur boulangère des blés du Maroc en 1932. Casablanca: Impr. Réunies, 1933, pp. 180, [figs. 10]*).—Milling and baking tests on numerous wheat samples of the 1932 crop showed the influence of variety, locality, fertilizer, irrigation, storage, and temperature during storage on the several technological characters of the wheat and flour. A number of correlations between important characters are included, with comments on technic.

Study of the semolina value of durum wheats of Morocco, E. Miège (*Etude de la valeur semoulière des blés durs Marocains. Rabat: Impr. Franco-Marocaine, 1933, pp. 55+[2], pls. 3*).—Technological tests made in 1931 and 1932 show the relative merits for semolina of a number of native and improved varieties of durum wheats grown in Morocco. The influences of variety, locality, and fertilizer are considered in detail, and technic is discussed briefly.

Summary of results of seed and legume inoculant inspection for 1933, J. G. Fiske (*New Jersey Stas. Bul. 562 (1934), pp. 24*).—The purity, germination percentage, and other information are tabulated for 2,645 official samples of seed of field crops, vegetables, and lawn mixtures obtained from dealers in New Jersey in 1933; and the crops, inoculation, number of organisms, and viability are shown for 65 official samples of legume inoculants.

Hoary cress control, A. Morgan (*Jour. Dept. Agr. Victoria, 32 (1934), No. 1, pp. 1–6, 40, figs. 6*).—Control studies on the Werribee State Research Farm and other institutions indicate that small patches of hoary cress (*Lepidium draba*) may be eradicated on dry-farming land. Thorough cultivation or hoeing is deemed the most reliable method. Where the subsoil is permeable, salting or carbon bisulfide may be used sucessfully. Chlorates were more expensive but no more effective than common salt. Arsenical sprays may be used with success, but may not be expected to give complete eradication under dry conditions of weather and soil. A recent development is the acid sodium arsenite spray as an alternative to the arsenite pentoxide spray previously recommended. Sowing down of alfalfa and pastures in irrigated areas, if accompanied by correct practice in regard to irrigation and fertilization, permits good control without loss of production.

HORTICULTURE

[Horticulture at the Indiana Station] (*Indiana Sta. Rpt. 1933, pp. 37, 38, 39, 40, 47, 54, 55, fig. 1*).—Data are reported on orchard soil management; apple pruning; dusting and spraying; comparison of stationary and portable sprayers; apple storage; manurial substitutes in growing carnations in the greenhouse; tomato improvement studies; use of supplemental electric light in the greenhouse; and a study of pumpkin varieties and factors affecting their value for canning. In addition, brief reports are included of investigations at the Moses Fell Annex Farm dealing with power consumption in portable and stationary methods of spraying, and the management of air-cooled apple storage.

[Horticulture at the Michigan Station], E. J. Miller and V. R. Gardner (*Michigan Sta. Rpt. 1933, pp. 215, 216, 243, 244*).—Notes are presented on the development of wax emulsions for treating nursery stock for the prevention of desiccation and mold during storage and after transplanting; varietal trials with raspberries and grapes; and peach breeding.

[Horticulture at the New Mexico Station] (*New Mexico Sta. Rpt. 1933, pp. 51–56, 58–61*).—Among studies reported, some in considerable detail, are those dealing with the phenology of fruits; varieties of pecans, walnuts, grapes, and tomatoes; fertilizer requirements of cabbage; smudging of fruit trees; and fertilizing and irrigation experiments with onions.

[Horticulture at the Washington Station] (*Washington Sta. Bul. 291 (1934), pp. 23, 37–41, 57, 58, 59*).—Brief progress reports are presented on the following studies: Removal of lead and arsenic residues from fruits, by J. L. St. John and K. Groves; treatment of winter injured trees, by E. L. Overholser, F. L. Overley, and L. L. Claypool; propagation of hardy apple stocks, by O. M. Morris; irrigation and culture of orchard cover crops, by Morris and Overley; fertilizer treatment of apples, pears, and lettuce, by Overholser, Overley, and Claypool; bud injury from oil sprays on apple trees, by Overley and Overholser; irrigation of orchards, by Claypool; harvesting and packing of peaches, by Morris; control of little leaf of fruit trees, by Overholser and Claypool; breeding of red raspberries and strawberries, by C. D. Schwartze; and pruning of cranberry vines, prevention of frost in cranberry bogs by forced air circulation, effect of spray treatments on the keeping quality of cranberries, and the improvement and fertilization of blueberries, by D. J. Crowley.

Planting table for vegetable gardens in Georgia, J. E. Bailey (*Georgia Sta. Circ. 101 (1934), pp. 8*).—In connection with the tabulated information, brief comments are presented on the growing of vegetable plants in hotbeds and in the open.

[Vegetable investigations at Cheshunt], W. F. Bewley, O. B. Orchard, B. D. Bolas, R. Melville, and W. H. Read (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 18 (1932), pp. 16–31, 58–68, figs. 3*).—Of various nitrogen-carrying fertilizers tested for tomatoes in the greenhouse of the Experimental and Research Station, Cheshunt, England, none proved outstanding, the calculated yields being 38.3, 34.6, 36.8, 36, 34.4, 38.8, 34.9, 37.9, and 37.4 tons of fruit per acre for sulfate of ammonia, nitrate of soda, cyanamide, nitrate of lime, dried blood, hoof and horn, guano, fish manure, and shoddy, respectively. No benefit was obtained from top-dressing tomato beds with 6 in. of sod or from setting plants in the bottom of a 12-in. trench and later filling up with a suitable compost. In fact the sod introduced certain harmful factors, including wireworms. In variety tests the yield ranged from 51.1 tons per acre for Pauls No. 12 to 23.2 tons for Walker Recruit. Wide varietal differences were observed also in the percentage of No. 1 tomatoes.

The use of soil amendments, such as straw, peat, and old chrysanthemum roots, proved beneficial where the soil, despite heavy manuring for long periods, had become unfavorable to tomatoes. Averages of 44.4 and 44.8 tons per acre from limed and unlimed plats indicated that the tomato has wide tolerance with respect to soil acidity.

Soil-heating experiments with cucumbers showed that the supplying of extra heat by means of electric cables laid beneath the beds will increase the yield of steam-sterilized beds by 10 percent and of unsterilized beds by as much as 33 percent. A mean bed temperature of 88° F. was found optimum for the cucumber.

Determinations of the nitrate changes in the soil of beds prepared for but not actually planted to tomatoes showed a maximum of approximately 240 p.p.m. in dry soil in May, with a minimum of approximately 30 p.p.m. in September. Nitrogen in the ammoniacal form was very low and for the whole year was less than 1 percent of the nitrate nitrogen. The fluctuation of nitrate nitrogen was similar in steamed and unsteamed soil. Wetting the soil thoroughly but not to the point of seepage sharply decreased the amount of nitrates in the top soil. Since the total nitrogen obtained in lysimeter drainage was considerably less than the losses due to nitrate decline, the fate of the difference is considered puzzling, and the possible existence of a nitrate immobilizer which under certain conditions takes up and under other conditions releases nitrates is conjectured.

In greenhouse compartments thermostatically controlled to maintain minimum night temperatures of 67°, 65°, 65°, 55°, 55°, and 50°, the computed yields were, respectively, 52, 61.5, 62.8, 53.1, 56.2, and 53.7 tons per acre, indicating an optimum air temperature for tomatoes of from 63° to 65°.

In physiological studies with tomatoes it was observed that during a dull winter day plants may gain as much as 7.7 percent in weight, but that most of the gain is lost in respiration during the long nights. Excessive temperatures tended to limit assimilation and at the same time increase respiration losses, and, therefore, during winter when light intensity is low may be actually harmful. Observations on the growth of several vegetables in a greenhouse supplied with supplemental evening light from various type lamps showed that germination was considerably accelerated, apparently from the radiated heat. Observations on growth subsequent to germination showed only the cucumber to respond greatly to the supplemental light.

A comparative test of some bean varieties, A. E. Hutchins (*Minn. Hort., 62 (1934), No. 4, p. 76*).—Of 12 varieties of bush snap beans tested at the Minnesota Experiment Station during the period 1931–33, the Delicious Wax led in yield and Bountiful in earliness.

Sweet corn variety and strain test for 1933, C. H. Mahoney, J. H. Muncie, and A. R. Marston (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 162–166, fig. 1*).—In tests involving a total of approximately 50 yellow and 18 white varieties, strains, and hybrids of sweet corn, the hybrid forms, especially those produced by crossing two inbred lines, were outstandingly productive. Top crosses obtained by crossing an inbred line on a commercial variety were also highly productive. Extremely early varieties—Golden Gem, Spanish Gold, and Golden Early Market—bore small ears and were unproductive.

A marked correlation was observed between early maturity and the abundance of bacterial wilt. However, there was no direct correlation between the amount of wilt observed and the production of marketable ears. Spanish Gold, Golden Gem, and Extra Early Bantam, for example, showed from 93

to 100 percent of wilt, whereas in Country Gentleman the average was only 3 percent.

Growing sweet corn in Texas, P. C. Mangelsdorf (*Texas Sta. Circ. 69* (*1934*), *pp. 27, figs. 6*).—Asserting that varieties of sweet corn from the Northern States are ill adapted to Texas, the author discusses two new varieties, Surcropper Sugar and Honey June, developed by the station by crossing native field varieties with Country Gentleman and then repeatedly back-crossing the hybrids to their field corn parents. The new varieties are described in detail with respect to height of plant, size and number of ears, time of ripening, resistance to ear worms, quality, and adaptation. In addition there is presented general information on the culture of sweet corn, production and care of seed, use of sweet corn as animal feed, etc.

As grown at College Station, the percentage of shuck to the total weight of ear in Stowell Evergreen, Surcropper Sugar, and Honey June was 28.1, 38.4, and 37.7, respectively. In 1933 the percentage of marketable ears in the same three varieties growing at College Station was 83, 99, and 98 percent, respectively. The percentage of total sugar in the three varieties was 6.44, 6.23, and 5.88, respectively. Two days of storage at room temperature reduced the total sugars in the Surcropper Sugar variety from 8.33 to 4.12 percent and in Honey June from 6.65 to 4.47 percent.

Furrow irrigation of apple orchards, I, II (*Wash. State Hort. Assoc. Proc.*, *28* (*1932*), *pp. 217–230, fig. 1*).—Two papers are presented.

I. *Soil moisture relationship*, C. A. Larson (pp. 217–222).—Studies conducted by the Washington Experiment Station at the Irrigation Substation at Prosser in a sandy soil underlain with partly disintegrated calcareous hardpan at both 20 and 30 in. showed very poor water penetration on plats previously clean cultivated. The maximum run-off reached 50 percent on one of these areas. Alfalfa proved a distinct aid to water penetration, due apparently in part to the roots breaking up the subsoil. The addition of an inadequate amount of water tended to decrease the reserve water supply. Adequate water neither increased nor decreased the reserve, and an excess of water caused an accumulation in the subsoil. The amount of water needed at each irrigation is said to depend upon the depth of the root zone and the texture of the soil. With shallow zones water must be applied frequently in order to supply adequate moisture. Legumes proved useful in disintegrating the calcareous hardpan and enlarging the water storage capacity of the soil.

II. *Tree and fruit response*, L. L. Claypool (pp. 223–230).—Studies of apple trees in the various irrigation plats at the Irrigation Substation indicated that certain external manifestations might be used as indexes to the water needs of fruit trees. For example, in 1931 Winesap trees receiving 30 acre-in. of water and irrigated only lightly during the preceding season showed a marked depression in terminal growth as compared with trees receiving 40 acre-in. or more of water. The leaves of the 30 acre-in. trees also were significantly reduced in size. Trunk girth increment of the trees receiving light irrigation was not equal to that of comparable trees with adequate water. Some evidence was obtained that impaired efficiency of leaves one season tends to reduce production the subsequent year. Color of fruit was not materially affected by irrigation. Lightly irrigated trees produced fruit with more red color in 1931, but this color was dull. The author concludes that trees of a given size and leaf area with similar cover crops use approximately the same amount of water during the season, irrespective of how much is applied, assuming that the supply is adequate in all cases.

Progress report of fertilizer studies with apples, F. L. Overley, E. L. Overholser, and K. A. McKenzie (*Wash. State Hort. Assoc. Proc.*, *28* (*1932*)

pp. 801–811).—Studies conducted by the Washington Experiment Station at several points in the State indicated that nitrogen either alone or in combination with other elements tends to increase size and decrease color. As a result, fruits from nitrogen plats were slightly less firm at harvest time. However, after 5 and 8 mo. of storage at 32° F. the differences in firmness due to fertilizer treatments were less marked; in fact evidence was obtained that seasonal conditions exert a greater influence on firmness of flesh than do differential fertilizer treatments.

In Jonathan large-sized apples were found more susceptible to break-down than were small apples, and fruits from trees having a large leaf area per apple were more susceptible than those from trees having a limited leaf area per fruit. It was noted, however, that the percentage of Jonathan break-down varied from year to year irrespective of fertilizer treatment.

Concerning soft scald, delay in storing fruit was more of a factor in its development than were differential fertilizer applications. Nitrogen fertilizer did tend to produce fruits slightly more susceptible to scald than those from the nonnitrogen plats. The variation in the amount of June drop between trees of a single plat was as great as between different plats. June drop was greater in weak than in strong trees. No measurable direct influence of fertilizers upon winter injury to fruit buds was established.

Trees receiving nitrogen alone or in combination required more thinning of fruits than did no-nitrogen trees, and the set of fruit was greater than in the unfertilized and no-nitrogen plats. Where nitrogen was insufficient in the soil the addition of this element alone or in combination generally increased yields. There was some slight evidence that phosphorus added to nitrogen slightly increased yields above nitrogen alone. The color of fruit was decidedly lower in trees receiving nitrogen than in the controls or the phosphorus plus potash trees. The use of phosphorus or potash alone tended to decrease the size of Jonathan apples, but when these elements were combined the reduction was much less noticeable.

Practical suggestions for fertilizing apple trees are given.

The thinning of closely planted apple trees, W. Toenjes (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 174–183, figs. 4*).—Part of a block of Oldenburg apple trees at the Graham Substation, originally planted 20 ft. apart in 1914, was thinned in 1930 by removing the diagonal rows to stand 28 ft. apart. Subsequent measurements showed a greater increment in trunk girth and shoot growth in the 28-ft. trees. The net returns from the two plats during the first 3 yr. following thinning were practically equal, but the individual trees in the 28-ft. area produced more and larger fruits. Codling moth and scab injury on the fruit was little different in the two plats, but the foliage on the 20-ft. plat was more subject to spray injury.

Fruit bud formation in the Delicious apple, C. P. Harley and M. P. Masure (*Wash. State Hort. Assoc. Proc., 28 (1932), pp. 134–137*).—Studies carried on by the U.S. Department of Agriculture near Orondo, Wash., in 1931 and 1932 showed that the reduction of leaves per fruit on ringed limbs to 10 completely inhibited fruit bud formation. With 70 leaves per apple, every spur, regardless of type, blossomed the succeeding spring. With 30 leaves an average of about 50 percent of the spurs differentiated fruit buds. A periodic ringing experiment conducted to determine the beginning and end of fruit bud differentiation in the Delicious apple showed that differentiation may begin as early as June 17 and continue as late as July 29. It is believed that these extremes may possibly be extended in certain cases. Fruiting spurs from which apples were removed early, about June 1, formed flower buds abundantly,

but when the fruit was permitted to develop, bearing spurs produced a low percentage of fruit buds unless grown with 70 leaves per fruit.

Studies on the interrelation of leaf area, soil moisture, and nitrogen to fruit growth and fruit bud formation in the apple, C. P. Harley and M. P. Masure (*Wash. State Hort. Assoc. Proc., 28 (1932), pp. 212–216*).—Neither increasing the nitrogen supply nor modifying the soil water content was found in these studies, conducted by the U.S. Department of Agriculture, to affect the development of fruit buds, as measured by the time of differentiation or the number of fruit buds produced on various types of spurs. Leaf area, as measured in number of leaves per fruit, appeared to be the controlling influence. As to the effect of soil moisture on apple size, Delicious apples growing in a light, sandy loam continued to increase in volume in dry plats at about the same rate as those on trees growing in soil maintained at approximately its field capacity until the wilting percentage was reached. At this point fruit growth rate decreased rapidly in the dry plats. Jonathans in a heavy, deep clay loam soil receiving no irrigation from June 29 until harvest showed no significant decrease in volume growth, despite the fact that the soil appeared dry. Nitrogen fertilizers were particularly effective in increasing size in the case of Delicious trees in the dry plats. As to color influence, nitrogen fertilizers had but little depressing effect where trees were dry or where the soil was definitely deficient in available nitrogen. Delicious, Jonathan, and Winesap apples grown with insufficient leaf area colored poorly regardless of soil treatment or location of the tree.

A progress report of studies of "little leaf" of fruit trees in central Washington, E. L. Overholser, L. L. Claypool, and F. L. Overley (*Wash. State Hort. Assoc. Proc., 28 (1932), pp. 160–163*).—Zinc sulfate applied to the soil in late winter at the rate of from 30 to 40 lb. per tree produced a marked improvement in little leaf condition by midsummer. Some recovery was noted where from 10 to 15 lb. per tree were applied. The direct application of from 3 to 5 g of powdered zinc sulfate in holes bored in the base of the tree trunk was tested and found promising.

Studies pertaining to the utilization of Washington fruits made by the State College of Washington, E. L. Overholser (*Wash. State Hort. Assoc. Proc., 28 (1932), pp. 181–184*).—Apple pomace, a byproduct of canneries and vinegar factories, was found of approximately the same value as beet pulp as a feed for dairy cattle. Pomace had no effect on the flavor or the odor of the milk. Preliminary observations suggested that pomace should prove to be a good silage material and that cull apples would be an effective supplement in fattening lambs. The preparation of an unfermentable cider is discussed.

Some promising and unpromising new peach varieties, S. Johnston (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 185–188, fig. 1*).—Stating that of the peaches prominent in 1897 only the Elberta remains important, the author describes a number of new and promising varieties revealed by tests at the South Haven Substation. In the list arranged according to ripening season are Arp, June Elberta, Oriole, Golden Jubilee, Halehaven, Vedette, Valiant, Elberta, Fertile Hale, Wilma, and Salberta.

The effect of pruning in the training of young olive trees, H. E. Jacob (*California Sta. Bul. 568 (1934), pp. 26, figs. 13*).—Having noted in earlier studies (E.S.R., 48, p. 445) a decidedly depressing effect of heavy and moderately heavy pruning on the growth and fruiting of the Mission olive, an orchard of Mission, Manzanillo, Sevillano, and Ascolano trees was set out in 1924 with a view to repeating the study and determining the response of other varieties. The influence of a variety was manifest in the fact that by 1930

the mean growth of the Manzanillo under all types of pruning was only about one half that of Sevillano and Ascolano. As to the effect of degree of pruning on fruiting, the crops during the sixth and subsequent years were about the same in each variety, irrespective of treatment, except in the case of the severely pruned trees, which in fact did not produce a commercial crop in the entire 7 yr. Severely pruned Ascolano trees suffered from wood-rot fungi entering through sunburned areas. No marked difference was observed in the form of trees at the end of 7 yr., whether shaped by light annual pruning or by heavy pruning in later years, and the depressing influence on growth was about the same.

Our vineyards, H. Faes and A. Paschoud (*Notre vignoble. Lausanne, [Switz.]: Payot & Co., 1932, pp. 222, figs. 93*).—This is a general treatise dealing with culture, protection against pests, propagation, pruning, training, etc., of vinifera type grapes.

The storage behaviour of limes, C. W. Wardlaw (*Port-of-Spain, Trinidad: Govt., 1933, pp. 23, figs. 19*).—Utilizing five varieties, namely, West Indian, East Indian, Philippine, Trinidad Hybrid T1, and Trinidad Hybrid T6, the author found at the Imperial College of Tropical Agriculture at Trinidad that the varieties differed considerably in the loss of weight at any given temperature and that all except the T6 showed definite possibilities for both green and yellow lime markets. The stage of maturity at the time of harvest was found an important factor in influencing the appearance of the fruit following storage. Immature fruits tended to suffer severely from dehydration. In general, limes could lose from 12 to 14 percent of their weight without marked shriveling, and a relative humidity of 85 percent or more in the storage room was desirable. The wrapping of fruits with silver foil greatly reduced moisture loss in storage, but because of cost it is advised that cellophane or paper wrappers dipped in wax or other waterproofing material should be used instead. A storage temperature of 45° F. was found best suited for the lime.

This is a more complete report of a study noted (E.S.R., 70, p. 52).

Experiments in the use of old soil in growing carnations and roses, F. F. Weinard and S. W. Decker (*Illinois Sta. Bul. 400 (1934), pp. 24, figs. 3*).—Comparisons of used and fresh soil as growing media for carnations showed somewhat higher yields in the fresh soil but no appreciable difference in the quality of the flowers, as measured by length of stems and diameter of the blooms. The percentage of split flowers averaged a little lower on the old soil. Steaming of soil was highly effective in increasing the number and improving the quality of blooms. Liming had some beneficial effect on yield, and there was also some evidence that lime improved quality. From the results the authors conclude that old soil if properly steamed can be kept in a productive condition indefinitely.

Comparable experiments with Ophelia, Golden Ophelia, and Silver Columbia roses showed that the growing of young plants in old soil reduces materially the yield of cut flowers. However, when plants 2 or 3 yr. old were transplanted into new soil there was observed only slight difference in yields as compared with undisturbed plants in old soil, indicating that the advantages accruing from new soil were offset by the transplanting. When the quality of blooms was considered, there was no noticeable difference on the two types of soil.

William Terrill Macoun, D. Sc., M. B. Davis (*Ill. State Hort. Soc. Trans., 67 (1933), pp. 193–198*).—In this brief biographical sketch there are indicated the outstanding horticultural contributions of Dr. Macoun.

FORESTRY

[Forestry at the Indiana Station] (*Indiana Sta. Rpt. 1933, pp. 32–35, figs. 3*).—Brief comments are given on the economics of crosstie and piling production; comparison of returns from ties cut from different trees; marketing basket and handle stock; effect of grazing on farm woods; forest nursery tree production; and the development and management of windbreaks.

Bark thickness of some Michigan trees, C. D. La Rue (*Mich. Acad. Sci., Arts, and Letters, Papers, 17 (1933), pp. 201–227*).—Measurements taken at the University of Michigan on the bark thickness of several species of forest trees showed hemlock (*Tsuga canadensis*) to have the thickest and beech (*Fagus americana*) the thinnest bark. The percentage of bark relative to the diameter of the trunk was greatest in *Populus tremuloides* and least in *F. americana*. The percentage of bark relative to diameter decreased rapidly from the ground to a height of 1 m and increased again near the top of the tree.

Some physiological effects of girdling northern hardwoods, H. I. Baldwin (*Bul. Torrey Bot. Club, 61 (1934), No. 5, pp. 249–257*).—Observations on northern New England yellow birch, sugar maple, and beech trees girdled in February and March showed large accumulations of sugars above the wounds. During the first season following treatment there was found from 20 to 300 times as much sugar above the cut as below and from 2 to 3 times as much as in the untreated trees. Two years after girdling the sugar reserves were much depleted, to the point of being less than normal, even above the ring. Moisture content above the rings was about 10 percent higher the first year and 10 percent lower the second than that below the wound.

Resistance to girdling, as measured by the time required to cause death, varied with the species, the short-lived, intolerant, and soft-textured species succumbing more rapidly. Premature autumnal coloration was characteristic in girdled trees in the first year. Notching with an ax was more effective than simply peeling in causing carbohydrates to be concentrated above the wounds.

Pine vs. hardwoods, A. B. Bowman (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 196–199, figs. 2*).—Records taken on the comparative increases in growth and value of the timber in natural hardwood stands and in planted white pine showed that the pine increased in growth and value over a 15-year period more than twice as rapidly as did the hardwoods. Even when the income from maple products was added to the hardwood returns the total was definitely lower than that of the pine. From the results it is concluded that barren areas could be most profitably planted to white pine.

Studies of Scottish moorlands in relation to tree growth (*[Gt. Brit.] Forestry Comn. Bul. 15 (1933), pp. 128, pls. 11, figs. 12*).—In considerable areas of the west of Scotland peat layers interfere with the growth of forest trees. Sitka spruce and Norway pine, the trees chiefly grown on the peat, seemed to suffer from a lack of air, which resulted in the roots being confined to the surface layers where available food supplies were low and where the roots were subjected to extremes of moisture and of temperature. Soil acidity, although high, did not appear to be an important factor in limiting tree growth. Deep drainage, with few exceptions, proved ineffective in providing aeration because of the slow rate of movement of water in the peat soils. Basic slag was found to be an effective soil ameliorant, because, in addition to its nutritive materials, it indirectly hastened the decomposition of peat into amorphous humus by providing a satisfactory environment for bacteria.

Stumpage and log prices for the calendar years 1931 and 1932, compiled by H. B. Steer (*U.S. Dept. Agr., Statis. Bul. 44 (1933), pp. 104, figs. 3*).—

Statistical information is presented on price levels and demand for stumpage and logs during the calendar years 1931 and 1932. In many cases the data are classified according to species, regions, type of sales, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, October 15, November 1, and December 1, 1933 (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 17 (1933), Nos. 12, pp. 145–156; 13, pp. 157–168; 14, pp. 169–176*).—Among other items of current interest, these issues contain the following notes:

No. 12.—Leaf variegation appears in the Blakemore strawberry; tolerance of unpicked cranberry fruit to flooding; late fruit infection with apple scab in New York; results of 1933 phony peach survey; diseases of nuts in Washington and Oregon (reporting walnut blotch due to *Marssonia juglandis*, bacterial blight of walnut, and powdery mildew of filbert); further reports on bacterial wilt of corn (from Indiana, New Jersey, New York, and Maine for 1933, attacks being wide-spread and more severe than in 1932, except where resistant types of corn were used or where planting was delayed); diseases in community gardens in Ohio; black rot of cabbage in Virginia (causing severe damage); fruit rot (*Sclerotinia sclerotiorum*) of squash and pumpkin in Montana; Dutch elm disease in the United States this year (577 attacked trees having been found in four States); stem rot (*Sclerotium rolfsii*) of Korean lespedeza in North Carolina; and new host (*Cassia artemisoides*) for the root knot nematode (*Heterodera marioni*).

No. 13.—Brown rot of cauliflower, by C. Chupp and J. G. Horsfall (prevalent in the Catskill region and considered nonparasitic, but related to higher soil acidity, higher temperatures, and lower rainfall than normal); disease survey notes for September in Massachusetts; *Mycosphaerella* wilt and rot of cucurbits (especially prevalent); tobacco diseases in North Carolina; bacterial wilt of corn in Michigan and Massachusetts; leaf variegation of the Blakemore strawberry found in Louisiana; citrus canker in Texas; apple diseases in Maine (nonparasitic leaf scorch, calyx-end blackening); leaf diseases of trees in New Jersey (elm leaf spot (*Gnomonia ulmea*), horsechestnut leaf blotch (*Guignardia aesculi*), and hawthorn leaf spot (*Entomosporium thuemenii*), all unusually severe in 1933); the Dutch elm disease; and rusts of Alabama (partial list).

No. 14.—Fungus flora accompanying decline of boxwood, by C. F. Andrus; further increase of blight, *Bacillus amylovorus*, in New York, by E. M. Hildebrand (reporting comparative amounts of infection in different varieties of apples and pears during 1933); diseases of Persian walnut in Oregon (first report of *Ascochyta juglandis* and *Microstroma brachysporum* in the Pacific Northwest); a little-known fungus (*Articularia* sp.) on pecans; recent observations on diseases caused by nematodes, by G. Steiner and E. M. Buhrer; diseases of alfalfa in California, by J. L. Weimer (bacterial wilt, dwarf, rust, anthracnose, and yellows); *Helminthosporium* on corn and velvet grass in Oregon (*H. turcicum* and *H. triseptatum* on *Zea mays* and *Notholcus lanatus*, respectively); *Phytophthora infestans* in New Hampshire (very destructive on tomatoes and unusually prevalent on potatoes); root rots on deciduous fruit trees in the eastern United States, by J. S. Cooley (caused by *Xylaria*, *Armillaria*, an unidentified white fungus, and nonparasitic agencies); and downy mildew on spinach in Virginia (appearance delayed by drought).

[Plant disease investigations in Indiana] (*Indiana Sta. Rpt. 1933, pp. 18–21, 38, 46, 48, 49, figs. 3*).—Data are reported on corn selection and breeding for resistance to dry ear rot (*Diplodia zeae*) and bacterial wilt; wheat breeding and selection for resistance to cereal leaf rust and other diseases and study

of physiologic forms of leaf rust; aster wilt; tomato disease investigations, which disclosed the presence in three cases of the potato ring spot virus along with tobacco mosaic, whereas the "healthy" potato virus combined with tobacco mosaic is usually the only one met with in the streak complex; control of apple sooty blotch and flyspeck with sprays of Bordeaux mixture, flotation sulfur, and colloidal sulfur, and infections on apple obtained with suspensions of spores taken from a variety of native host plants; soil rot and stem rot of sweetpotatoes; control of bacterial canker of tomatoes; the discovery of the bark phase of apple measles; a physicochemical study of plant viruses; and the effects of leaf rust in reducing the yield and protein content of wheat.

[Botany at the Michigan Station], E. A. Bessey (*Michigan Sta. Rpt. 1933, pp. 214, 215*).—Findings are briefly noted as to seed treatments for stinking smut of wheat and oat smut, bacterial wilt of sweet corn, yellow dwarf of potato (artificially transmitted to tomato, two species of *Nicotiana*, and to *Physalis* sp.), potato scab control, celery breeding for wilt resistance, rosette of peach, successful trials of the resistant tomato varieties John Baer and Nellist Ideal, and comparative anatomy and physiology of Maize-Amargo (resistant) and Duncan corn (susceptible) to corn borer.

[Plant disease studies in New Mexico] (*New Mexico Sta. Rpt. 1933, p. 43*).—Mention is made of the work under way to determine the cause of apple measles; the favorable results with aluminum and iron sulfate used to overcome chlorosis in trees, shrubs, and Concord grapes; and the failure of attempts to transfer the strain of violet root rot (*Rhizoctonia crocorum*) on sweetpotatoes to other crops.

[Plant disease investigations in Washington] (*Washington Sta. Bul. 291 (1934), pp. 13, 14, 41, 42–44*).—Results are briefly reported of work on physiologic forms of bunt and the relation of bunt infection to winter survival of wheat, by E. F. Gaines, A. M. Schlehuber, and C. S. Holton; on the value of zinc for little leaf of fruit trees, by E. L. Overholser and L. L. Claypool; and on the relative severity of various plant diseases in Washington in 1932, by F. D. Heald and L. K. Jones.

List of plant parasites found by the plant inspection service in the different ports of Brazil in 1932 [trans. title] (*Campo [Rio de Janeiro], 4 (1933), No. 3, pp. 66–68*).—This list includes the host plants (common Brazilian names).

Report on the work of the seed propagation division for 1931 (*[Irish Free State] Dept. Agr. Jour., 31 (1932), No. 2, pp. 203–219*).—Detailed results of seed distribution, fertilizer trials, and disease treatments are given. Rainfall was heavy, resulting in poorly prepared ground, low yields, and poor quality. Ceresan and Abavit were effective in preventing smut in barley but only delayed stripe or net blotch (*Helminthosporium*). Ceresan delayed browning disease (*Polyspora lini*) in flax but did not prevent it.—(*Courtesy Biol. Abs.*)

Observations and investigations conducted at the national phytopathological station during 1932 [trans. title], E. Marchal (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 2 (1933), No. 2, pp. 147–159, fig. 1*).—After recalling the meteorological conditions which influence the development of parasitic fungi, the author gives an account of the sanitary conditions of cultivated plants in Belgium during 1932. The following fungi are new to Belgium: *Cercosporella albo-maculans* on turnips, *Hartigiella laricis* on young larches, *Phoma cyclamineae* on cyclamen, *Pestalozzia tumefaciens* on *Abies*, and *Septoria rostrupi* on chrysanthemum.

India: Diseases in the Bombay Presidency, B. N. Uppal (*[Internatl. Rev. Agr.], Internatl. Bul. Plant Protect., 7 (1933), No. 5, pp. 103, 104*).—*Peronospora trigonellae* on *Trigonella foenum-graecum*; *Pestalozzia palmarum*,

common on leaves of coconut, now found attacking undeveloped nuts; *Uromyces fabae* on *Pisum sativum*; *Oidium erysiphoides* on *Zizyphus jujuba*; *Sclerotium rolfsii* on *Cannabis sativa*; *Cercospora rosicola* on rose; mosaic on *Helianthus annuus* and *Momordica charantica*; and *Rhizoctonia bataticola* on *Ricinus communis* are all new to the region.—(*Courtesy Biol. Abs.*)

India: New disease in the Bombay Presidency, B. N. UPPAL (*[Internatl. Rev. Agr.], Internatl. Bul. Plant Protect., 7 (1933), No. 1, p. 4*).—The author presents the first records in Bombay for *Uredo* on *Ficus benghalensis*, *Puccinia helianthi* on *Helianthus annuus*, and *Striga* on *Paspalum scrobiculatum*. A race of bacteriophage specific against *Pseudomonas citri* was isolated from leaves of citrus with citrus canker.

Division of mycology annual report for the year 1932, A. THOMPSON (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 14 (1933), pp. 53–62*).—This reports on diseases of oil palm, coconut, tea, coffee, tobacco, potato, citrus, pepper, *Shorea leprosula*, cucumber, pumpkin, etc.—(*Courtesy Biol. Abs.*)

[Author index of the publications on the subject of plant pathology and mycology in Japan issued in 1911–32], Y. NISIKADO, H. MATSUMOTO, ET AL. (Reprinted from *Agr. Res. [Japan], 11 (1927), pp. 132–168; 12 (1928), pp. 91–159, 160–189; 14 (1930), pp. 470–505; 16 (1930), pp. 196–237; 17 (1931), pp. 352–392; 17 (1932), pp. 395–468; 19 (1932), pp. 469–504; 20 (1933), pp. 377–421*).—The numbers of this index which have thus far appeared in the Japanese publication *Agricultural Research* cover the period from 1911 to 1932 inclusive.

The development of the ascus and the occurrence of giant ascospores in Coccomyces hiemalis, M. P. BACKUS (*Bul. Torrey Bot. Club, 60 (1933), No. 9, pp. 611–632, pls. 4, figs. 2*).—The asci arise through crozier formation. An acetocarmine technic, used in connection with dissected material and found useful in supplementing the regular cytological technics in studying the origin of the asci and other features in this fungus, is here described. The fusion of nuclei in the crozier was observed, and the details of the large primary ascus nuclei were studied. "Chromatin beads" are a prominent feature of these nuclei. The division figures observed presented the features commonly described for nuclear division figures in asci. Four chromosomes were found at the equatorial plate stage in all divisions (i.e., first, second, and third). The spores are cut out with the aid of astral rays associated with beaked nuclei. They are formed as spherical bodies, which subsequently undergo elongation. The occasional occurrence of asci with giant spores is reported. Such abnormal asci have fewer than eight spores. Evidence is presented, on the basis of a cytological study, that two or more nuclei are incorporated in each giant spore at the time it is delimited, and big spores, containing from two to six nuclei, are figured. The possible significance of such abnormal ascospores is indicated.—(*Courtesy Biol. Abs.*)

The rust-flora of the Dominican Republic, F. D. KERN, R. CIFERRI, and H. W. THURSTON, JR. (*Ann. Mycol., 31 (1933), No. 1–2, pp. 1–40*).—A complete check list is given of the rusts known from this country (with detailed data of localities and dates for all collections not previously reported). One hundred and eighty species are reported, of which 55 are reported here for the first time. A bibliography of previous records from the region is given. The following are described as new species: *Aecidium hispaniolae* on *Solanum rugosum*, *Puccinia ekmani* on *Leersia monandra*, *P. faramede* on *Faramea occidentalis*, *Uredo ornithidii* on *Ornithidium coccineum*, *U. polytaenii* on *Polytaenium feei*, and *U. uncinata* on *Dorstenia* sp. *U. dioscoreicola* n.sp. is pro-

posed for what has passed as *U. dioscoreae* in the West Indies. Types of new species are in the herbarium at the Pennsylvania State College.

A host list is appended.

A new Sclerospora from Nyasaland, W. H. WESTON, JR. (*Phytopathology, 23 (1933), No. 7, pp. 587–595, figs. 2*).—In the resting spore stage (the only reproductive phase so far known) the surface of the oogonium shows distinctive, rounded, bullate, or papillate protrusions from the darker exospore, while the oospores within are the smallest of any *Sclerospora* yet encountered, even smaller than those of *S. noblei*. The parasite is described as a new species, *S. butleri*. The host, *Eragrostis aspera*, is an addition to the list of grasses parasitized by *Sclerospora* spp.

Serological studies of plant viruses, J. M. BIRKELAND (*Bot. Gaz., 95 (1934), No. 3, pp. 419–436*).—The viruses of tobacco mosaic, spot necrosis, ring spot, and cucumber mosaic were studied by the serological technic. Several methods of purification were used in an attempt to free them from contaminating antigenic substances. Rabbits were immunized against these various purified preparations and also against crude extracts of diseased and healthy tobacco plants. The results of cross precipitin tests and precipitin adsorption tests indicate (1) that viruses may be freed from antigenic constituents of healthy plants by several methods of purification, (2) that the juice from virus-diseased plants contains, in addition to the antigenic constituents of normal plants, an antigenic fraction, which, by the methods employed, was inseparable from the virus, and (3) that this antigenic fraction appeared to be specific for a particular virus. The serological technic appears to be of value in the study of plant viruses.—(*Courtesy Biol. Abs.*)

Some virus diseases of the potato and other farm crops, K. M. SMITH (*Scot. Jour. Agr., 16 (1933), No 4, pp. 446–456, pls. 3, figs. 2*).—This is a practical account in which the role of insects in the transmission of plant viruses is considered.

The relative importance of Cercosporella herpotrichoides and of Leptosphaeria herpotrichoides as parasites of winter cereals, R. SPRAGUE (*Phytopathology, 24 (1934), No. 2, pp. 167, 168*).—*C. herpotrichoides* is a much more active parasite of winter cereals than is *L. herpotrichoides*. The need for a restudy of the straw breaker foot rot of winter cereals in northern Europe is pointed out. Most of the damage in northern Europe now attributed to *L. herpotrichoides* will, in the light of recent study in the Pacific Northwest and in France, probably be found to be caused by *C. herpotrichoides*.

Contributions on the foot rot of cereals and its control [trans. title], E. W. SCHMIDT and W. FEISTRITZER (*Wiss. Arch. Landw., Abt. A, Arch. Pflanzenbau, 10 (1933), No. 3, pp. 391–421, figs. 2*).—The authors, from 2 years' results, conclude that foot rot of cereals was reduced by directly turning under the stubble to a depth of 34 cm (13.4 in.). Almost as good results were obtained by turning under the stubble to a depth of 24 cm, especially for early seeding after potatoes. The practice of disking before turning under the stubble and peeling off the stubble was ineffective in reducing foot rot.

Foot rot attack can be reduced to a minimum by late seeding of winter wheat, especially if combined with direct deep plowing of the stubble. Although a planting of winter wheat after winter wheat is heavily attacked, this can be reduced by turning under the stubble deeply and planting late. However, it is better to put spring wheat after winter wheat. The maturity of various varieties had very little or no influence on severity of attack.

Although no positive or negative evidence was obtained by applying partial artificial fertilizers, the application of unrotted stable manure appeared to

increase foot rot. Plowing under of diseased stubble and also potato tops had little or no effect. Treating field stubble with H_2SO_4 reduced the attack, while the results with Caporit were not very indicative, and kaolin was ineffective. *Fusarium culmorum* was the predominating isolate in 1931 and 1932, and *F. nivale*, *Ophiobolus graminis*, and *Leptosphaeria herpotrichoides* were also isolated (the latter two only in 1932). The significance of such isolation experiments is discussed.—(*Courtesy Biol. Abs.*)

A physiologic form of Septoria tritici on oats, R. Sprague (*Phytopathology, 24 (1934), No. 2, pp. 133–143, figs. 2*).—A physiologic form of *S. tritici*, which attacks oats (*Avena* spp.) but not wheat (*Triticum vulgare*), is locally severe in portions of the humid coastal strip in Oregon. Cross-infection studies, studies of pure cultures from wheat and oats, as well as exsiccati, showed that, except for slightly smaller spores, the fungus on oats was practically identical with *S. tritici* on wheat. *S. graminum C. avenae* is listed as a synonym of *S. tritici* on oats.

Development of oats resistant to smuts and rusts, T. R. Stanton, H. C. Murphy, F. A. Coffman, and H. B. Humphrey (*Phytopathology, 24 (1934), No. 2, pp. 165–167*).—Hybrid strains of oats have been isolated from a cross of Victoria (resistant to crown rust and smut)×Richland (resistant to stem rust) which show a combination of resistance both to crown rust and stem rust and to the smuts of oats. The adaptation and value of these new oats for use on farms remain to be determined.

Ball smut in wheat: Methods of control, A. A. Lee (*Jour. Dept. Agr. Victoria, 32 (1934), No. 2, pp. 57–59, 75, figs. 3*).—Yield trials of wheat treated with standard copper carbonate, formalin, and bluestone were carried out over a period of years in departmental plats at Longerenong, Werribee, and Rutherglen, Australia, and it was found that with copper carbonate (2 oz. per bushel) the yields were 37.0, 11.3, and 26.81 bu.; with formalin (1–450 for 3 min.), 35.7, 10.4, and 23.8 bu.; and with bluestone (1.25 percent for 3 min.), 34.1, 10.3, and 22.4 bu. average yield at the three respective stations. When wheat was wet pickled, the subsequent yield was reduced, bluestone being more detrimental than formalin in this respect. At Rutherglen, where it is important to get the plants through the surface and well established with as little delay as possible, pickling with formalin reduced the yield 3 bu. per acre below that from the dry-pickled seed, while over a 5-year period bluestone made a difference of as much as 4.4 bu. per acre.

The author concludes that of the three smut diseases of wheat, flag smut, loose smut, and ball smut, flag and loose smuts are not controlled by ordinary pickling methods. Ball smut is controlled by careful and efficient pickling; wet pickling with formalin or bluestone, which retards germination and reduces yield; and dry pickling with copper powders, which does not retard germination nor reduce yield. The latter is recommended as the most convenient and efficient method available.

Observations on the downy mildew of wheat [trans. title], V. Possenti (*Riv. Patol. Veg., 23 (1933), No. 3–4, pp. 123–127*).—Severe attacks of downy mildew caused by *Sclerospora macrospora* on wheat occurred in the Tevere (Tiber) Valley in 1929, but the attacks gradually diminished in intensity until there were almost none in the crop year 1931–32. Plants grown from seed in infested soil became infected, but transplanted plants did not. Field observations showed that attacks are more or less intense according as water remains in the soil longer or shorter periods.—(*Courtesy Biol. Abs.*)

Losses caused by rust in wheat, W. J. Pretorius (*Farming in So. Africa, 8 (1933), No. 82, pp. 12, 13*).—A record is given of losses in Cape Province for the 1930–31 and 1931–32 seasons.

The resistance of grain to rust attack and the influence of fertilizers thereupon [trans. title], W. Acker and F. König (*Ernähr. Pflanze, 29 (1933), No. 6, pp. 101–105; Eng. and Span. abs., pp. 119, 120*).—The crop was winter wheat following red clover. The soil had a pH value of 6.15–6.55, the plant-food content according to the Neubauer method being K_2O 24–29 mg, P_2O_5 4.2–5.3 mg. The experiment comprised the following plats: (1) Without mineral fertilizer, (2) PK, (3) NK, (4) NP, (5) NPK½, (6) NPK. The fertilizers were applied in the following form: K=160 kg per hectare as chloride, P=70 kg per hectare as basic slag, and N=40 kg per hectare as Montansalpeter. In the case of KP-manuring, a considerable acceleration of the growth was observed. The severity of the rust attack was estimated by counting the rust pustules per 90 frames of 50-sq. m area. The result of the count on the 5 plats was: O=2,056, PK=1,463, NK=1,282, NP=2,025, NPK½=1,664, and NPK=1,320. The incidence of yellow rust on the wheat was thus generally limited by applications of mineral fertilizers. This was especially the case on the NK and NPK plats. The 3 plats with the least rust infection showed at the same time the highest yields of grain.

In agreement with other trials elsewhere it was shown that fertilizing with K_2O salts can prevent to a great extent attack from rust. It is probable that the effect of K_2O in increasing the physiological resistance of the plants is due to the fact that the easily assimilable chloride ion changes the composition of the cell sap in such a way as to produce conditions unfavorable to the growth of the fungus, possibly due to a reduction of the insoluble N compounds in the plant. The morphological resistance of grain crops is improved by K_2O as a result of its influence on the xerophilous characteristics of the plant structure.

The progressive extension of an epidemic of Urocystis on wheat [trans. title], V. Rivera and E. Corneli (*Riv. Patol. Veg., 23 (1933), No. 3–4, pp. 171–176*).—Since its appearance on wheat at Perugia in 1928 the culm smut caused by *U. occulta* has continued to get more serious, being exceptionally so in 1933. In a large planting of the variety Virgilio about one fifth appeared to be lost. While nearby fields of Gentil Rosso wheat were attacked, none was found after careful search of rye fields, although this has been considered the principal host. Rieti wheat was less severely affected than Virgilio and Gentil Rosso. Frassineto was reported nearly immune at Trasimeno but severely attacked in Toscana, as were also Zara and S. Maria. When seed of Gentil Rosso wheat was covered with spores of *Urocystis* and afterward treated, half of it with a 5 percent solution of $CuSO_4$ for 15 min. followed by a milk of lime bath, the treated seed gave only one diseased plant, the untreated 50 percent. No infections were obtained by floral inoculations.—(*Courtesy Biol. Abs.*)

Vegetable seed disinfectants (*New Jersey Stas. Circ. 299 (1934), pp. 2*).—The value of vegetable seed treatment by means of hot water, corrosive sublimate, organic mercurials, red copper oxide, and other materials is discussed, and the use of appropriate materials for particular kinds of seed is described.

Viroses of the bean, W. H. Pierce (*Phytopathology, 24 (1934), No. 2, pp. 87–115, figs. 5*).—"The susceptibility of 24 varieties of beans to the following viruses was determined by means of artificial inoculations in the greenhouse: Common bean mosaic virus (Bean Virus 1), yellow bean mosaic virus (Bean Virus 2), alfalfa mosaic virus (Alfalfa Virus 2), tobacco mosaic virus (Tobacco Virus 1), and tobacco ring spot virus. Bean Virus 2 and Alfalfa Virus 2 had not been previously described.

"Bean Virus 1 and Bean Virus 2 both produced systemic infection on beans, but the symptoms produced by Bean Virus 2 were much more severe. Alfalfa

Virus 2 and Tobacco Virus 1 caused only a local necrotic infection, and the tobacco ring spot virus caused both local and systemic infection on beans. Symptoms on differential varieties were described. . . .

"The thermal death point of Bean Virus 1 and Bean Virus 2 was found to lie between 56° and 58° C. for 10 min., of Alfalfa Virus 2 between 62° and 64°, and of tobacco ring spot virus at 66°. In aging-in-vitro experiments, Bean Virus 1 and Bean Virus 2 lost their infectivity after from 24 to 32 hr.; Alfalfa Virus 2 and tobacco ring spot virus in from 7 to 9 days. The infectivity of all the viruses was either lost or greatly reduced at dilutions greater than 1–1,000. Treatments with alcohol, nitric acid, and formaldehyde showed minor differences in the resistances of the viruses to these treatments."

Bean Virus 2 was shown to be transmitted by the potato aphid and the pea aphid. Alfalfa Virus 2 was readily transmitted by the pea aphid.

In tests involving 6,532 seedlings, no evidence of transmission of Bean Virus 2 through the seed was obtained. Bean Virus 1 was transmitted through the seed as previously reported by others.

Host-range studies showed important differences between the viruses studied. Sweetclover was found to be susceptible to Bean Virus 2, and it was suggested that this host may serve to overwinter this virus.

Black-leg of cabbage (*New Jersey Stas. Circ. 300 (1934), pp. 2*).—A brief popular description is given of the history, symptoms, cause, and successful methods of control of the disease produced by *Phoma lingam*.

Reduction of chile wilt by cultural methods, F. Garcia (*New Mexico Sta. Bul. 216 (1933), pp. 15, figs. 5*).—This bulletin describes the results of the different cultural practices tried out experimentally for the purpose of reducing to a minimum losses from the attacks of *Fusarium annuum*, which has caused more or less severe damage on chili since about 1908 in irrigated parts of New Mexico. The data indicate the advantage of the furrow-ridge system of culture over other methods in this respect. Five-year averages showed only 7 percent of diseased plants for this system as against 19.2 percent for the native ridge method and 41.7 percent for level culture. A clear drawing illustrates the differences in these methods.

Very frequent irrigation may increase the percentage of blighted plants. Tests extending over 7 yr. showed that with the furrow-ridge system blight averaged 21.7 percent in the plats irrigated weekly, 7.8 percent when irrigated every 2 weeks, and 5 percent when irrigated every 3 weeks. The accumulation of irrigation water in depressions was conducive to blight and so was heavy soil texture.

A ringspot-like virus disease of red clover, E. M. Johnson (*Phytopathology, 23 (1933), No. 9, pp. 746, 747, fig. 1*).—A natural occurrence of chlorosis and necrosis in ringlike areas up to 2 cm in diameter was observed on *Trifolium pratense* in Kentucky. Yellow areas with necrotic borders also occurred on stems. Only a few leaves of a plant were affected. Although the spots resembled those of yellow ring spot of tobacco and tobacco plants thus affected grew close to the clover, efforts to inoculate tobacco from the clover were unsuccessful. The disease did not reappear in seed progeny of the affected plants.—(*Courtesy Biol. Abs.*)

Downy mildew of lima beans (*New Jersey Stas. Circ. 297 (1934), pp. 2*).—The history, symptoms, cause, and methods of control are briefly described.

Alkali scorch of Bermuda onions, J. J. Taubenhaus and W. N. Ezekiel (*Amer. Jour. Bot., 21 (1934), No. 2, pp. 69–71, fig. 1*).—A shipping and storage injury of onions, named "alkali scorch", has caused appreciable loss of Texas-grown white Bermuda onions. The injury resulted apparently from heavy

impregnation of alkaline material in the jute bags used for onion storage or shipment. The trouble was produced experimentally by placing sound onion bulbs in such bags.

Onion rusts of Japan, I, K. Goto (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 5 (1933), No. 2, pp. 167–177, figs. 2*).—The onion rusts of Japan, including Taiwan (Formosa), are separable into a southern and a northern group. Seven European collections were studied for comparison. No significant differences were recognized in the uredia. Some differences were noted in the telia, e.g., the southern organism is characterized by small (0.5–0.8×0.3–0.5 mm predominant), black to grayish black, persistently covered sori with partition walls composed of numerous, reddish brown paraphyses, the northern form by somewhat large (0.8–1.5×0.5–1.0 mm predominant), blackish brown to grayish, readily ruptured sori with very few and less prominent paraphyses.

Inoculation studies were made on six species of *Allium* with strains from Morioka (northern organism) and Taihoku (southern organism). On *A. bakeri* and *A. odorum* both were innocuous, on *A. porrum* a northern strain produced a few uredia and a telium only once, on *A cepa* the northern strains were more virulent, while on *A. fistulosum* and *A. scorodoprasum* both were equally pathogenic. The northern strains produced telia readily on the last three host plants, the southern strains very sparingly on *A. fistulosum* alone.

Potato diseases, R. B. Morwood (*Queensland Agr. Jour., 40 (1933), No. 5, pp. 382–395, figs. 9*).—Irish blight (*Phytophthora infestans*), target spot (*Alternaria solani*), *Fusarium* wilt and dry rot, bacterial wilt, blackleg, scab, black scurf (*Corticium solani*), minor root and stem rots (*Sclerotium rolfsii* and *Armillaria mellea*), virus diseases (mosaic and leaf roll), and the physiological diseases black heart, hollow heart, brown fleck, and glassy end are discussed, together with diseases not present in Queensland.

General control measures and potato seed treatment methods are given.

Ecology and break-down of potato vitality, I, II [trans. title] (*Pflanzenbau, 8 (1932), No. 9, pp. 213–218; 9 (1933), No. 8, pp. 303–313, figs. 5*).—Two papers are here given.

I. *Investigational methods*, [E.] Klapp.—The author outlines the essential requirements in set-up and method for experiments designed to investigate the various possible causes of potato degeneration and to distinguish those types of degeneration which are due to viruses and those for which other factors are responsible. The technic used, conditions established, and individual examples of the series of records taken in the author's intensive investigations on this subject are presented in detail, with a discussion of the procedures necessary to avoid erroneous conclusions. The advantages are brought out of keeping individual plant records and planting of seed pieces from the same tuber under different experimental conditions, instead of the usual replicated row or plat methods.

II. *Climate, soil, and wild flora in healthy and unfavorable situations*, [E.] Klapp and Spennemann.—Three regions (1 where regularly no break-down of potato vitality occurs, 1 where there are varying amounts of this, and 1 where there is usually much break-down) were studied from the viewpoints of ecology and plant geography. From the first to the third region there is a decrease in altitude, precipitation, and humidity, and an increase in temperature, richness of soil, vegetative period, and saturation deficit. In one extreme the climate is atlantic montane and in the other continental. The soils in one extreme are tolerably heavy, more or less podsolized; and in the other there is loam with frequent loess or black earth surface.

A study over a period of several years of the vegetation of the potato fields, the margins, and the neighboring meadows showed that where break-down did not occur the elements were northern, montane, subatlantic, with many plants from heath soils. Where heavy break-down occurred there were continental plants, or imported southern European species. Although one cannot conclude from a few species whether break-down will occur, the general character of the flora is deemed a fairly reliable guide.

Resistance of potato to mosaic and other virus diseases, E. S. Schultz, C. F. Clark, R. Bonde, W. P. Raleigh, and F. J. Stevenson (*Phytopathology, 24 (1934), No. 2, pp. 116–132*).—Some factors involved in resistance to viruses are heritable, and it is thought that resistance and susceptibility to mild mosaic can be interpreted by two or more genetic factors that are cumulative in effect. A new potato variety, Katahdin, resistant to mild mosaic (the common mosaic type in Aroostook County, Maine) has been produced. One new variety is highly resistant to the "latent" or masked potato virus. Spaulding No. 4 is more tolerant to streak than are some of the other commercial varieties. Some seedlings and commercial varieties are highly susceptible to both mild and latent mosaic and show definite mosaic and necrotic sypmtoms. Other varieties contract latent mosaic readily, but the symptoms are masked. Some varieties are highly resistant to mild mosaic. Some seedlings readily contract both mild and latent mosaic when inoculated by artificial means, but seldom become diseased when grown under field conditions. Such varieties may prove to have morphological or physiological characters that interfere with effective inoculation by insect vectors. All varieties tested have been found susceptible to leaf roll and spindle tuber.

The biotypes of Phytophthora infestans and their geographic distribution in Germany [trans. title], K. O. Müller (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 13 (1933), No. 11, pp. 91, 92, fig. 1*).—The author indicates from cultural studies, with varied environmental conditions, the existence of a "biologic race" of *P. infestans* which he designates as the S form. In parts of Germany and in foreign countries where the ordinary varieties of potatoes have long been grown, the A form occurs. The S form occurs only in sections where the *Phytophthora* resistant or W races of potatoes are cultivated.—(*Courtesy Biol. Abs.*)

Potato scab and Rhizoctonia and their control (*Amer. Potato Jour., 10 (1933), No. 4, pp. 65–73*).—A popular account for the benefit of potato growers is given of the results of experimental work and observations through 1932 for Maine, by W. P. Raleigh, R. Bonde, and V. C. Beverly; for Nebraska, by R. W. Goss; for New York, by C. F. Taylor and L. L. Stirland; for Ohio, by P. E. Tilford; and for Wisconsin, by B. J. Dippenaar and R. E. Vaughan.

Factors influencing the occurrence of potato scab in New York, F. M. Blodgett and F. B. Howe ([*New York*] *Cornell Sta. Bul. 581 (1934), pp. 12, figs. 4*).—In this bulletin are given the results of a survey in which 313 samples of 100 tubers each were taken in the field in various parts of New York State during 1931 and 1932 and examined for tuber defects, including scab (*Actinomyces*), statistical computations being made to determine the significance of any apparent correlation with other factors.

The authors found that, based on the reaction of the surface soil, potatoes on soils from pH 4.8 to 5.4 had the least scab, more from pH 7.5 to 8.5, and most from pH 5.45 to 7.4. With reference to elevation, there was significantly more scab at elevations between 400 and 1,200 ft. than above or below that range. Of the varieties commonly grown in that State, Russet Rurals were the least attacked by scab, then, in order of increasing susceptibility, Smooth Rurals,

Cobblers, Green Mountains, and Up-to-Dates. There was generally less scab where potatoes followed sod rather than potatoes or other cultivated crops. Seed treatments apparently helped to control scab.

The cause of potato scab and methods of combating it [trans. title], F. Berkner (*Landw. Jahrb., 78 (1933), No. 2, pp. 295–342, figs. 3*).—Soil pH had a decided influence on the amount of scab (*Actinomyces* sp.) on potatoes. A soil near pH 6 was more favorable for the potato plant, and scab was less than on soils more alkaline. On light, poorly buffered, sandy soils the critical pH was lower than on heavier soils.

Lime increased the amount of scab in proportion to the amounts applied. When it was applied directly to the potatoes, but not in dry weather, the injury from scab was less noticeable than if applied earlier.

Physiologically acid-reacting fertilizers, such as ammonium sulfate, superphosphate, calcium sulfate, and calcium-magnesium sulfate are recommended. Fresh stable manure was not recommended, whereas well-rotted stable manure and green manures were.

Control by acidifying the soil with flowers of sulfur or sulfuric acid was possible but is limited in practice because of inconveniences.

Resistant varieties offer the best means of securing scab-free potatoes. None seems absolutely immune, but some are practically so. A large number of table and industrial varieties was tested, and these are listed in the order of their susceptibility.—(*Courtesy Biol. Abs.*)

Frog-eye (Cercospora diazu Miura) on stems, pods, and seeds of soybean, and the relation of these infections to recurrence of the disease, S. G. Lehman (*Jour. Agr. Res.* [*U.S.*], *48 (1934), No. 2, pp. 131–147, figs. 2*).—This contribution from the North Carolina Experiment Station adds to information already reported regarding the frog-eye disease of soybean (E.S.R., 59, p. 849). Stem lesions appear only late in the season, are elongated, depressed, and successively red, brown, and smoke gray in color. Black stromata on old lesions frequently give a black color to the lesion. The mycelium is confined chiefly to the cortex, but the underlying phloem and cambium are usually damaged. Pod lesions are round, depressed, from 1 to 4 mm across, and reddish brown to brown on green pods but light brown circled by a dark brown ring on ripe pods. Conidia are often present. The mycelium grows completely through the pod wall and into the seed without causing a definite lesion or marked discoloration. The seed coat at this point, however, is roughened and depressed and often has bits of pod wall lining adhering. The embryo is rarely if at all invaded, and seed treatment kills out the fungus in most infected seeds. The fungus overwinters on diseased leaves and stems.

Diplodia ear rot in inbred and hybrid strains of sweet corn, G. M. Smith and J. F. Trost (*Phytopathology, 24 (1934), No. 2, pp. 151–157, figs. 2*).—Records of ear attack by *D. zeae*, occurring as the result of natural field infections at the Indiana Experiment Station, were made on 259 inbred and hybrid strains of sweet corn and on 135 inbred and hybrid strains of dent corn grown under conditions of heavy natural infection. In the sweet corn group, 14.8 percent of the ears were infected as compared with 9.5 percent in the dent corn group. There was little relation between the occurrence of natural infection in inbred strains of sweet corn and their first generation hybrids. A group of inbred strains of sweet corn selected for disease resistance showed less infection than a similar group selected on the basis of canning value alone during the early stages of inbreeding.

Sweet potato scurf (*New Jersey Stas. Circ. 298 (1934), pp. 2*).—The nature of this disease and methods of dealing with it are described.

Summary of the diseases and pests of Deli tobacco in 1932 [trans. title], (*Meded. Deli Proefsta. Medan, 2 ser., No. 83 (1933), pp. 33, fig. 1*).—Observations are recorded for Sumatra on diseases by S. C. J. Jochems (pp. 3–21) and on animal pests by J. C. van der Meer Mohr (pp. 22–33).

On the destructive tobacco disease "Brazilian savage" known in Sicilia (Sicily) as "zimma" [trans. title], S. MONASTERO (*Bol. Tec.* [*R. Ist. Sper. Coltiv. Tabacchi, Scafati*], *30 (1933), No. 2, pp. 105–109*).—The nematode *Aphelenchus parietinus* causes this widespread disease in Sicilia. The nematode is not carried over in the seed but overwinters principally in rotted tobacco roots and in *Urtica dioica*, a common weed. Gathering and burning all infested tobacco and *U. dioica* roots and discontinuing the use of nematode-harboring manure appear to be the best control practices.—(*Courtesy Biol. Abs.*)

Frog eye leaf spot and barn spot of tobacco, L. F. MANDELSON (*Queensland Agr. Jour., 40 (1933), No. 5, pp. 401–408, fig. 1*).—These diseases, both due to *Cercospora nicotianae*, are rarely found in southern Queensland, but in northern Queensland they are second in importance only to blue mold. Symptoms and conditions favoring development, and control measures as applicable to this region, are discussed in detail.

Concentration of the virus of the mosaic of tobacco, B. JOHNSON (*Amer. Jour. Bot., 21 (1934), No. 1, pp. 42–53*).—Treatments were applied at the University of Wisconsin to juices of tobacco plants infected with the virus of typical tobacco mosaic in order to obtain a concentrated suspension of the virus as free from extraneous material as possible. A process involving successive treatments with Celite, Nuchar 00, $(NH_4)_2SO_4$, and dialysis and evaporation was the best process tried. Although comparatively high concentrations of virus were secured, there was some loss of virus during the treatments. Tests for proteins usually were positive in virulent concentrated preparations of virus, and negative for similar preparations from juice from healthy plants. —(*Courtesy Biol. Abs.*)

Fusarium niveum, the cause of watermelon wilt, B. SLEETH (*West Virginia Sta. Bul. 257 (1934), pp. 23, figs. 5*).—A study of 23 isolation strains of *F. niveum* from widely scattered sources in the United States showed that physiologic specialization exists within the species, as indicated by extreme variations in virulence as well as by cultural differences. These variations lead the author to consider at least a majority of the isolants as distinct strains. Tests with seedlings of eight varieties or crosses of watermelon showed all to be susceptible to attack by the more virulent strains. Eleven isolants proved only slightly pathogenic or nonpathogenic to all varieties tested.

Two strains of *F. niveum* produced dissociants in culture. Similar dissociants were recovered from plants inoculated with these strains. In two cases they were identical with dissociants obtained in artificial culture.

Watermelon varieties bred for resistance were more resistant than the common commercial sorts, but the author concludes that "it seems likely that the development of a resistant watermelon must depend upon its resistance not only to one but to many pathogenic strains."

Disease symptoms produced by Anguillulina pratensis in yams, G. STEINER and E. M. BUHRER (*Phytopathology, 24 (1934), No. 2, pp. 164, 165, fig. 1*).—Disease symptoms on imported yams are pictured, showing small elevations over the entire tuber surface caused by the meadow nematode *A. pratensis*. Further disease stages show brownish tissue below the elevations, then a continuous discolored layer, penetration inward, and, finally, general decay.

Diseases of cultivated Rosaceous fruits [trans. title], E. Ronna (*Campo* [*Rio de Janeiro*], *4* (*1933*), *Nos. 2, pp. 49–53, figs. 13; 3, pp. 26–32, figs. 22*).—The author presents a brief compendium of information on orchard diseases and their control, with special reference to Brazil.

Trials with fruit tree and vine treatments [trans. title], G. Arnaud (*Min. Agr.* [*France*], *Ann. Épiphyties, 18* (*1932*), *No. 6, pp. 357–367, pl. 1*).—In spray experiments made near Versailles in 1931 and 1932, 3 applications of 2 percent Bordeaux mixture controlled *Venturia pyrina* on pear, 3 applications of 1 percent Bordeaux mixture controlled *V. inaequalis* on apple, and 5 applications of 2 percent Bordeaux mixture controlled *Plasmopara viticola* on grape. A colloidal copper preparation (B.C.C.) was reasonably effective for the same fungi, but clearly inferior to Bordeaux mixture.—(*Courtesy Biol. Abs.*)

Spraying and dusting experiments on fruit trees [trans. title], E. Johansson (*Sveriges Pomol. För. Årsskr., 34* (*1933*), *No. 1, pp. 1–14; Eng. abs., pp. 12, 13*).—These experiments on fruit trees in the south of Sweden, 1931–32, were carried out especially to compare the efficiency of spraying and dusting in control of scab on apples and pears, Bordeaux mixture and lime-sulfur being used as sprays, and Bordeaux powder (dehydrated $CuSO_4$ and lime) and sulfur compounds as dusts. It was found that scab on apples can be successfully controlled by one or two preblossom sprays with Bordeaux mixture and from two to three postblossom sprays with lime-sulfur. This program is recommended when the trees are attacked by the red spider mite.

No spraying damage was caused on Cox Orange variety by 1 spraying with Bordeaux mixture 0.5–1–100 before blossoming and 3 lime-sulfur sprayings after blossoming. Bordeaux dust showed a similar effect to that of spraying with basic Bordeaux mixture, but seemed to cause greater damage to the fruit of some apple varieties than the spray. It is generally not to be recommended for apples.

Sulfur dusts are comparable to lime-sulfur spray as to their effectiveness, and are effective also against red spider mite. The number of winter eggs of this mite is greater on those apple trees which had no applications of sulfur compounds the preceding summer. Niagara Colodust and Colotex and some sulfur compounds resembling them, called Dana dusts and made in Denmark, were tried. Two preblossom and 4 postblossom applications of Colodust gave a rather satisfactory control of scab on Cox Orange in 1932. One spraying with Bordeaux mixture before blossoming and 3 with lime-sulfur after blossoming were, however, more effective. Apple and pear varieties more susceptible to scab can hardly be protected by dusting with sulfur compounds alone in years when weather conditions are favorable to the fungus. Though dusting is as a rule less effective against scab than spraying, it may often be preferable, especially because less labor is required.

Bees not cause of epidemics of fire-blight, A. L. Pierstorff and H. N. Lamb (*Gleanings Bee Cult., 61* (*1933*), *No. 4, pp. 216, 217*).—"Honeybees spread *Bacillus amylovorus* from blossom to blossom after it was introduced artificially into several blossoms on the lowermost branches. Fire blight infection was not obtained on a caged pear tree from a hive artificially infested two days previously with *B. amylovorus*" in experiments conducted by these Ohio Experiment Station workers. "Transfer of bee colonies from one locality to another did not spread blight infection. Colonies of bees kept in the orchard year after year are not responsible for blight epiphytotics in Ohio."

Crown gall and hairy root of apples in nursery and orchard, W. O. Gloyer (*New York State Sta. Bul. 638* (*1934*), *pp. 30, figs. 15*).—The author reviews the history of the apple crown gall and hairy root situation and

discusses the causes of other malformations on apple roots. Records on the amount of crown gall attack in certain nursery blocks of budded pear, cherry, plum, and apple varieties in 1933 showed only small percentages of attack in cherries on mazzard stock, none on mahaleb stock, and practically none in plums on myrobalan stock, although the soil was badly contaminated from a previous planting of roses affected with crown gall. On the other hand apples on seedling stocks and pears on French stock grown on this soil showed a high percentage of infection, varying from 90 to 100 percent in the apple varieties and from 51 to 98 percent in the pears, while on noninfected soil nearby only a trace of gall could be found. The results of apple and pear inoculation experiments begun in 1926 are reported. In some cases visible gall formation did not result until the second or third season after inoculation.

In 1925 an orchard experiment was started using 433 Baldwin, Wealthy, and McIntosh nursery trees, some badly galled, some moderately galled, some with hairy root, and the rest healthy. Before planting records were taken of the size, diameter, and condition of each tree. Eight yr. later about four fifths of the trees were removed and comparable records again taken. It was found that the presence of crown gall and hairy root usually reduced the height as well as diameter increase. Diseased trees usually had poorer, often one-sided root systems. All galls had increased in size, were of the hard type, and in all but one case had failed to disintegrate. Sometimes galls were found which were not observed when planting. When roots readily form above a gall the tree may make normal growth. Trees affected with hairy root often produced excellent top growth, although the root system might be undersized as well as one-sided.

The practical problem of the grower and nursery inspector in relation to these troubles is thoroughly discussed. The author believes that no relaxation or modification of present inspection regulation is warranted.

Sooty blotch of apples [trans. title], J. BARTHELET (*Bul. Mens. Soc. Natl. Hort. France, 5. ser., 6 (1933), Mar., pp. 149, 150, fig. 1*).—The author refers to the frequent occurrence of sooty blotch in certain localities of western France and describes its characteristics. The causal fungus is *Gloeodes pomigena*.

The lime-sulphur substitutes and their role in the Virginia spray program, A. B. GROVE[S] (*Va. Stat. Hort. Soc. Rpt., 38 (1933), pp. 116–126*).—According to observations and tests by the Virginia Experiment Station, the spray substitutes for lime-sulfur on apples may be safely used only after the critical early scab applications. Many proprietary products have proved satisfactory in a schedule where lime-sulfur is used in the preblossom sprays. Dry lime-sulfur and flotation sulfur were the most generally satisfactory substitutes, especially when used early in the season. The former material cannot be used in interplanted peach and apple orchards.

A brief classification and characterization is given of the fungicides available to growers in this region.

The effect of sulphur fungicides, applied during the bloom, on the set of apple fruits, L. H. MACDANIELS and A. B. BURRELL (*Phytopathology, 24 (1934), No. 2, pp. 144–150*).—Lime-sulfur spray and sulfur dust, applied before pollination or within 24 hr. thereafter, reduced the set of McIntosh and Northern Spy fruits in experiments using spur units, branch units, and tree units. After this period, these sulfur materials did not reduce set consistently. The reductions were more pronounced from sulfur applications to whole trees early in the blooming period than later. There is a suggestion that lime sulfur reduced the set more than did sulfur dust. The results obtained by removing the styles from apple blossoms at intervals after pollina-

tion indicate that under favorable temperature conditions pollen tubes may traverse the style in 48 hr. or less. This agrees, in general, with the interval after which fungicides may be applied without reducing the set of fruit.

Bacterial canker of stone-fruit trees in California, E. E. WILSON (*Hilgardia* [*California Sta.*], *8* (*1933*), *No. 3*, *pp. 83–123*, *figs. 8*).—This contribution traces the history of this disease on the Pacific coast and compares it with similar troubles reported in Europe. The results of investigations by the author extending over several years bring him to the conclusion that two distinct but closely related bacterial organisms are both responsible for practically indistinguishable injuries to stone fruit trees in California. Their effects may take the form of so-called "sour sap", in which entire trees or parts of trees fail to produce leaves in the spring, or put out foliage which soon dries up, after limbs or trunks have been girdled by bark lesions in which the tissues are dull brown, moist, and sour smelling. The same two bacterial forms are involved in the more common so-called "gummosis" type of disease characterized by the formation of better defined, deeper cankers and the presence of abundant gum. Careful study showed that the occurrence of one type of disease or the other depended not on which type of organism was present but on the variety of tree, growth conditions, season, etc. One or another of these organisms has been found associated also with dormant bud blight, blossom blight, green shoot blight, and leaf spot.

The two types of bacteria were compared with each other by artificial inoculations and morphological and cultural studies, which included also a culture of *Pseudomonas prunicola* obtained from England through the courtesy of [H.] Wormald. The results of these studies are described. One of the California types, isolated in but 10 to 15 percent of the cases, readily produces a green coloration of most culture media used. This "green" strain is considered identical with the organism described from Oregon by Griffin in 1911 (E.S.R., 26, p. 144) as *P. cerasus* (*P. cerasi*). The more frequently isolated or "white" strain of organism is almost identical in morphology, cultural reactions, and pathogenicity but does not produce the greening of media typical of the other strain. The author considers this insufficient grounds for regarding it as a distinct species. He assigns it to the position of a variety which he designates *P. cerasi prunicola* n.v. A technical description is given. On the basis of comparative inoculation and culture studies, *P. prunicola* of Europe is considered identical with this white strain from California. It is further suspected that this type of organism from stone fruits may prove on further study to be identical with *Bacterium syringae* and *B. citriputeale*.

The seasonal activity of the California organisms in their attack on stone fruits is confined almost entirely to the dormant period of the tree when defensive wound cork formation apparently does not occur. Artificial inoculations made from midspring to midautumn usually failed, at other times succeeded. Canker development is more rapid in late fall and early spring than in midwinter when temperatures are lower. Bacterial advance stops before the end of the spring. Differences in host susceptibility were noted for different types of fruits and for different varieties within the type. Apricots, sweet cherries, and plums are apparently, on the whole, more susceptible than peaches and almonds under California conditions.

The plum rust on apricot and peach, E. S. SALMON and W. M. WARE (*Gard. Chron.*, *3. ser.*, *94* (*1933*), *No. 2453*, *pp. 490–492*, *figs. 3*).—*Puccinia pruni spinosae*, long known in England on plums, has been found for the first time on apricot and peach in England.

The blue spot disease of unripe grapes [trans. title], A. OSTERWALDER (*Schweiz. Ztschr. Obst u. Weinbau, 42 (1933), No. 19, pp. 334–338, figs. 4*).—The author briefly describes a bluish gray spot disease of unripe grapes in Switzerland, appearing in August. It is determined to be a physiological disease, similar in appearance and nature to the bitter pit disease of apples. The blue-spotted berries do not fall prematurely as do those infected with *Peronospora*. Spot formation soon comes to a standstill, and since the skin and a thin cortical layer under it remain living such affected berries are protected from drying out and may come to maturity.

A canker and gall disease of Gardenia, H. N. HANSEN and C. E. SCOTT (*Science, 79 (1934), No. 2036, p. 18*).—A fungus with two spore types (hence belonging in the genus *Phomopsis*) infected stems and crowns of several varieties grown in California greenhouses. Infection occurred only through wounds and most readily in parts near or in contact with soil.—(*Courtesy Biol. Abs.*)

Paraphelenchus maupasi attacks hyacinth bulbs, G. STEINER and E. M. BUHRER (*Phytopathology, 24 (1934), No. 2, pp. 163, 164, fig. 1*).—The first reported heavy infestation by the nematode *P. maupasi*, which has caused definite disease symptoms, is pictured in a cross section of a hyacinth bulb. The disease differs from that of the bulb nematode *Anguillulina dipsaci* in that it progresses more by way of segments than by following the rings formed by the scales of the bulb.

Host specialization in the rust of iris, Puccinia iridis, E. B. MAINS (*Amer. Jour. Bot., 21 (1934), No. 1, pp. 23–33, figs. 4*).—In this study, started at the Indiana Experiment Station and continued at the University of Michigan, the resistance and susceptibility of a large number of wild and cultivated species and varieties of iris to two specialized races of this parasite were investigated. Considerable diversity of reaction was not unusual between two individual plants of the same host species.

Tuberculina maxima in western North America, J. L. MIELKE (*Phytopathology, 23 (1933), No. 3, pp. 299–305*).—The lilac fungus, a parasite of the pycnia and aecia of several pine rusts, is reported for the first time in North America on *Cronartium ribicola* and *C. comptoniae*. The known distribution of the parasite on *C. ribicola* is limited to 2 small areas in British Columbia—one in the coastal plain and the other in the interior—and to one locality in Washington State. On *C. comptoniae* the parasite has been found only at Daisy Lake, B.C., in the coastal region. There is no evidence that *T. maxima* was introduced into this country with the introduction of *C. ribicola* to western North America. There is evidence, however, that it is indigenous, probably on one or all of its native pitch pine blister rust hosts. The parasite has never become generally destructive to either of the *Cronartium* spp. It is not considered an important factor in reducing aecial sporulation or in controlling *C. ribicola*.

Latest developments in avocado disease control, W. T. HORNE (*Calif. Avocado Assoc. Yearbook, 1933, pp. 28–32*).—An address discussing *Dothiorella* rot, tipburn, mottle leaf, and sun blotch.

Note on the incidence of cacao diseases in the British Colonial Empire and the steps being taken to investigate and control them, E. J. BUTLER (*Off. Internatl. Fabric. Choc. et Cacao* [*Bruxelles*], *Bul. Off., 4 (1934), No. 3, pp. 121–125*).—This article summarizes the existing situation regarding diseases of cacao in the British possessions and the efforts looking to their suppression. The text is in both English and French.

Panama disease of plantains, M. PARK (*Trop. Agr.* [*Ceylon*], *81 (1933), No. 5, pp. 330–333*).—The article gives a description of this disease, caused by

Fusarium oxysporum cubense, which has recently become well established in Ceylon. Control practices are discussed.

The Dutch elm disease (*New Jersey Stas. Circ. 296 (1934), pp. 2*).—This is a brief popular account of the Dutch elm disease situation, with a description of symptoms, effects, the relation of the European bark beetle to its dissemination, and the methods of control being practiced. An appeal is made for the reporting of suspicious cases and sending of specimens for laboratory diagnosis.

On the progressive destruction of plane trees in some zones of central Italy [trans. title], C. Sempio (*Riv. Patol. Veg., 23 (1933), No. 3–4, pp. 129–170, pls. 7*).—During the past five or six years *Platanus occidentalis* trees have been attacked with increasing severity by *Gnomonia veneta* in central Italy and especially at Perugia along a certain avenue. That cold, wet spring weather favors the disease seems to be confirmed by the experience of 1928 and 1929. The effects of disease, the way lesions are limited, and the method of overwintering are discussed. Severe pruning is advised as a means of control.

A remarkable spruce rust, Peridermium parksianum, n.sp., J. H. Faull (*Jour. Arnold Arboretum, 15 (1934), No. 1, pp. 86, 87*).—This article describes a rust on needles of the current season on *Picea sitchensis* from California and Oregon. The spermogonia are of *Melampsoropsis* type. Aeciospores are about 16 by 70μ.

The biology of Milesian rusts, J. H. Faull (*Jour. Arnold Arboretum, 15 (1934), No. 1, pp. 50–85, pls. 3*).—Milesian rusts are now known on 16 genera of polypodiaceous ferns and 11 species of *Abies*. Life histories have been determined for 9 species. The data on the life cycles of *Milesia fructuosa, M. intermedia, M. marginalis*, and *M. polypodophila* are recorded in this paper. The developmental period on *Abies* varies from 3 weeks to 3 years, according to the species. Spermatial discharge may continue for 1 month in *M. polypodophila* and aecial discharge for several weeks. Teliospores develop on affected overwintered fronds in most species, but in a few species they develop in the fall and in *M. fructuosa* both fall and spring. Teliospores formed in fall undergo a long resting period before they are viable. *M. fructuosa* is often without uredinia (*M. intermedia* form). *M. fructuosa* was successfully cultured on 7 species and 1 variety of *Abies*. The hosts showed some differences in reaction. Inoculations with aeciospores of *M. intermedia, M. marginalis*, and *M. polypodophila* on a series of fern species showed that they are restricted each to one host species. *M. fructuosa* (including *M. intermedia*) and *M. polypodophila* are of some economic importance in relation to forest reproduction. *M. fructuosa* is potentially a menace to *Abies magnifica*, which proved to be highly susceptible to this rust.—(*Courtesy Biol. Abs.*)

Zone lines in plant tissues, I, II, A. H. Campbell (*Ann. Appl. Biol., 20 (1933), No. 1, pp. 123–145, pls. 3; 21 (1934), No. 1, pp. 1–22, pls. 3, figs. 4*).—Two papers are here presented.

I. *The black lines formed by Xylaria polymorpha (pers.) Grev. in hardwoods.*—A brief account is given of the literature on zone lines in wood, and a preliminary attempt is made to classify the zone lines into groups. Development and stromatal production of *X. polymorpha* on artificial media and wood blocks are described. The fungus is established as a black line producer by its production of black lines in inoculated wood blocks. The morphology of the black lines is described in detail, and their actual formation has been observed in cotton wool. The suggestion is made that the black lines are the marginal zones of entostromata in the substratum comparable to those occurring in *Diaporthe*. The black lines produced by *Nummularia, Ustulina, Hypoxylon*, and *Daldinia* in the substratum are stated to be of similar structure and sig-

nificance. An account is given of a *X. polymorpha* black line superimposed upon the zone line formed by the attack of *Fomes applanatus* on beech wood The confusion existing in the literature on the zone lines of *F. applanatus* is partly attributable to this not uncommon phenomenon. The value of zone lines as criteria in the diagnosis of wood rots is discussed, and some of the difficulties in the identification of a zone line in a typical rot are pointed out

II. *The black lines formed by Armillaria mellea (Vahl) Quel.*—These black lines were studied as they occur in nature and in pure cultures. As they appear in section they form the rinds of sclerotium-like bodies in the wood of the host. The bodies, named pseudosclerotia, are largely buried in the wood sub stratum, but with a free extension of black xylostroma (including *Rhizomorpha subcorticalis*) below the bark from which the rhizomorphs (*R. subterranea*) arise as lateral branches. The rhizomorphs are simply an extension of the pseudosclerotium in the wood, and as such still retain the sclerotial function of bearing sporophores.

An account is also given of the biology of *A. mellea*, with particular reference to the pseudosclerotium and its significance in the reproduction of the fungus.—(*Courtesy Biol. Abs.*)

Giant galls caused by the root-knot nematode, G. Steiner, E. M. Buhrer and A. S. Rhoads (*Phytopathology, 24 (1934), No. 2, pp. 161–163, fig. 1*).—The largest nematode galls yet recorded, caused by the root knot nematode *Heterodera marioni*, are found to occur on the basal portions of the stems above ground instead of on the roots. The host plants discussed are *Thunbergia grandiflora, T. laurifolia, Begonia* sp., and *Rheum rhaponticum*. Photographs show the extreme tissue proliferations of plants having these giant, rugose galls. They are considered due mainly to autoinfection, the progeny of the first and succeeding generations of the nemic parasite remaining within the plant.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Wild Life Commission of Malaya, I–III (*Singapore: Govt. 1932, vols. 1, pp. 421+VII; 2, pp. 289+IX, pls. 33; 3, pp. 379+V*).—Volume 1 of this report relating to the protection of wild life in Malaya consists of a general survey. Volume 2 is devoted to recommendations, and volume 3 to Malayan enactments, extracts from laws of other countries, etc. The report includes a large-sized map showing the national parks, game reserves, and sanctuaries of Malaya proposed and in existence in 1931.

North America's waterfowl problem (*U.S. Dept. Agr., Biol. Survey 1934, pp. 3, pls. 24*).—This series of 24 maps of North America which show the region where most of the waterfowl breed is presented in mimeographed form in connection with descriptive matter which emphasizes the importance of supplying safeguards to prevent extermination. The series of years of disastrous drought over an important part of the breeding area of the northern Plains States and the prairie provinces of Canada has focused attention on the serious plight of ducks and geese. It is pointed out that the work of retiring from agriculture large tracts of submarginal lands seems to offer an opportunity to dedicate many more areas to the use of game and other useful birds, upland and aquatic, migratory and resident.

Report on the food of five of our most important game ducks, W. F. Kubichek (*Iowa State Col. Jour. Sci., 8 (1933), No. 1, pp. 107–126*).—This contribution reports upon the gullet and gizzard contents of five leading species of game ducks, namely, redhead (*Nyroca americana*), ring-necked duck (*N. collaris*), canvasback (*N. valisineria*), greater scaup duck (*N. marila*), and lesser scaup duck (*N. affinis*).

Bobwhite winter survival in an area heavily populated with grey foxes, P. L. Errington (*Iowa State Col. Jour. Sci., 8 (1933), No. 1, pp. 127–130*).—The data incorporated in this contribution from the Iowa Experiment Station relate to an area of about 5 square miles near Prairie du Sac, Wis. This was kept under observation from 1929 to 1933 in connection with studies of bobwhite quail winter mortality, a report relating to which has been noted (E.S.R., 69, p. 682).

Management of the bobwhite quail in Iowa, P. L. Errington (*Iowa State Col. Ext. Bul. 186 (1933), pp. 15, figs. 6*).—This is a practical account based upon investigations by the author noted above.

A catalog and host-index of the species of the coccidian genus Eimeria, N. D. Levine and E. R. Becker (*Iowa State Col. Jour. Sci., 8 (1933), No. 1, pp. 83–106*).—Following a catalog of the species of the genus *Eimeria*, in alphabetical form, a host index for the genus, systematically arranged, is given, followed by an eight-page list of references to the literature cited.

Time of exposure and temperature as lethal factors in the death of the oocysts of *Eimeria miyairii*, a coccidium of the rat, J. F. Reinhardt and E. R. Becker (*Iowa State Col. Jour. Sci., 7 (1933), No. 4, pp. 505–510, figs. 2*).—The authors have found the thermal death point (10 min. exposure) for the sporulated and unsporulated oocysts of *E. miyairii* to be approximately 49° C., and apparently a fraction of a degree less for the unsporulated forms. The unsporulated forms are killed in 15 sec. at 53°, and in 24 hr. at 41°. The sporulated forms perish in 2 min. at 52°. The critical thermal increment (μ) for the death of the unsporulated oocysts, as computed by the van't Hoff-Arrhenius equation, is about 140,000.

Some peculiar relationships between ectoparasites and their hosts, H. E. Ewing (*Amer. Nat., 67 (1933), No. 711, pp. 365–373*).—This contribution on the relations of parasites to their hosts presents certain new facts and summarizes and interprets certain old ones that have come to attention in the course of the study of ectoparasites.

Experimental studies in insect parasitism, I, II, G. Salt (*Roy. Soc. [London], Proc., Ser. B, 114 (1934), No. B 790, pp. 450–476, pl. 1, figs. 6*).—The first contribution (pp. 450–454) consists of an introduction and describes the technic involved, the second (pp. 455–476) deals with superparasitism.

"Statistical analysis of field data relating to natural parasitism by *Collyria calcitrator*, *Ibalia leucospoides*, and *Limnerium validum* shows that the parasites were not distributed at random among their hosts. A female of *Trichogramma evanescens* placed on a group of hosts can be observed to avoid ovipositing in hosts it has already attacked. A female of *Trichogramma* is able to distinguish between unparasitized hosts and hosts previously parasitized by another female, and avoids ovipositing in the latter. Females of *Trichogramma* are able, at least for a time, to retain their eggs rather than deposit them in parasitized hosts. This restraint leads to the deposition of fewer eggs than the parasites are actually capable of laying. When the number of hosts is limited, females of *Trichogramma* sometimes lay two, three, or even four eggs in some of them, but the number of cases of superparasitism is far smaller than would be expected from chance distribution. Females of *Trichogramma* are able to distinguish between large and small hosts, and, when the number of hosts is limited, select the larger ones for superparasitism.

"The hypothesis that the progeny of parasitoids are distributed at random, without reference to the previous parasitization of the host, is untenable for the species considered."

Transference of induced food-habit from parent to offspring.—Part I, D. E. Sladden (*Roy. Soc. [London], Proc., Ser. B, 114 (1934), No. B 790, pp.*

441–449).—This is a report of the results of studies of the walking stick *Carausius* (*Dixippus*) *morosus* in which individuals from stock reared on privet for many generations were induced with difficulty to feed on ivy.

On the enumeration of insect populations by the method of net collection, H. E. Gray and A. E. Treloar (*Ecology, 14* (*1933*), *No. 4, pp. 356–367, fig. 1*).—"Sweeping with an insect net was employed in an alfalfa plat with a view to determining the accuracy of this technic for purposes of enumerating insect populations. The work was carried on in such a manner as to insure that the principal variable was the distribution of the insects in the area. Forty units of 25 sweeps each, taken progressively along a line of traverse covering almost the entire field of 2.25 acres, provided the basic data. The insects in each collection were segregated into 28 taxonomic groups, 3,394 insects being counted in all. A statistical analysis of the data for the total number of insects in the 40 collection units and also in the 10 most abundant taxonomic groups is reported."

[Report of work with economic insects and their control in Indiana] (*Indiana Sta. Rpt. 1933, pp. 26–29, 38, 46, figs. 2*).—The work of the year briefly referred to (E.S.R., 69, p. 71) includes that with the onion maggot and onion thrips, striped cucumber beetle, Mexican bean beetle, blister beetles, mint flea beetle, European corn borer, corn ear worm, codling moth, oriental fruit moth, greenhouse mealybugs, efficiency of colored insecticides, and arsenic residues on apples.

[Report of work in entomology at the Michigan Station], R. H. Pettit (*Michigan Sta. Rpt. 1933, pp. 225–235, figs. 12*).—The work of the year (E.S.R., 71, p. 68) includes that with spraying for the control of the second generation of codling moth, and the control of the strawberry root weevil (a pest of seedling evergreens), the cherry and apple maggots, and the oriental fruit moth.

The major insect outbreaks which occurred during the season of 1932–33 referred to with notes on new findings include the imported rose stem girdler *Agrilus communis rubicola*, the strawberry leaf roller, imported currant worm, blackberry leaf miner *Metallus rubi*, *Dicerca divaricata*, treehoppers infesting fruit trees (*Glossonotus crataegi*), boxelder bug, mottled willow borer *Cryptorhynchus lapathi*, hickory bark beetle, grasshoppers (two-striped grasshopper, red-legged grasshopper, *Melanoplus atlanis*, etc.), corn ear worm, pea aphid, turnip aphid, squash bug, potato tuber worm, and cattle lice and sheep ticks (*Linognathus* (*Haematopinus*) *vituli*, the short-nosed cattle louse, the sheep tick, and *Trichodectes scalaris*). A propylene dichloride mixture was tested on stored grains and seeds.

[Economic insects in New Mexico and their control] (*New Mexico Sta. Rpt. 1933, pp. 36–42, 43, 44, 45, 56–58, figs. 3*).—The work of the year referred to in this report (E.S.R., 69, p. 232) includes comparisons of catches of codling moths in ordinary bait pans with electrified traps, electrified and illuminated traps, and of a combination mercury vapor light trap and Brer Rabbit cane sirup bait; the potato psyllid and psyllid yellows; alfalfa and vegetable garden crop pests, including *Euxoa inconcinna* Harvey, *Mamestra lilacina* Harvey, and *Chorizagrotis introferens* Grote; soil insecticides for the giant apple borer; arsenic in spray residue on apples; and spraying for codling moth.

[Work with insecticides and insect control at the Washington Station] (*Washington Sta. Bul. 291* (*1934*), *pp. 30–33, 58*).—The work of the year here briefly reported (E.S.R., 68, p. 780) includes that relating to oil sprays and toxicity of arsenicals, both by R. L. Webster and J. Marshall; and at the Cranberry Substation dormant sprays for control of oyster-shell and Putnam scales, fireworm control, and fruit worm control, all by D. J. Crowley.

Sixty-third annual report of the Entomological Society of Ontario, 1932 (*Ent. Soc. Ontario Ann. Rpt., 63 (1932), pp. 64, figs. 11*).—The contributions presented in this report (E.S.R., 69, p. 547) include the following: The Balance Sheet of Entomology, by W. H. Brittain (pp. 9–13); Insects of the Season 1932 in Ontario, by L. Caesar and W. A. Ross (pp. 13–20); Notes on Pear Psylla and San Jose Scale Control, by W. A. Ross, T. Armstrong, and D. F. Patterson (pp. 21–29); Observations on the Relation of Temperature and Moisture to the Oriental Peach Moth, by G. G. Dustan and T. Armstrong (pp. 29–39); Recent Developments in the Corn Borer Parasite Situation in Eastern Canada, by G. Wishart and I. E. Thomas (pp. 39–41); The Corn Borer Situation in Ontario in 1932, by L. Caesar (pp. 41–45); The Grasshopper Campaign in Manitoba in 1932, by A. V. Mitchener (pp. 45–48); The Control of the Locust Borer by Forest Management, by A. H. MacAndrews (pp. 48–50); Insects Infesting Grain in Farmers' Granaries in Southwestern Ontario, by G. M. Stirrett and D. A. Arnott (pp. 50–54); Sodium Fluoride as a Control for Cattle Lice, by R. W. Thompson (pp. 54–56); Some Notes on the Biology and Life-History of Psocids, by L. R. Finlayson (pp. 56–58); and The Present Status of the European Pine Shoot Moth in Southern Ontario, by R. W. Sheppard (pp. 58–61).

Report of the entomological division for the year 1932, F. A. SQUIRE (*Brit. Guiana Dept. Agr., Div. Rpts., 1932, pp. 133–140*).—This is a report of the occurrence of and control work with the principal crop pests of the year (E.S.R., 69, p. 548), presented under the headings of crops affected, including sugarcane, rice, coconuts, and pineapples.

[**Contributions on economic insects in China**] (*Lingnan Sci. Jour., 12 (1933), No. 4, pp. 473–488, 547–554, 577–594, pls. 6; 13 (1934), No. 1, pp. 103–133, 137–162, 171–176, 181, pls. 2, figs. 9*).—The contributions presented relating to economic insects in China include the following:

No. 4.—Catalogue of the Phytophagous Beetles of China, by G. Liu (pp. 473–488) (E.S.R., 70, p. 651); A Preliminary Study of the Gryllotalpinae (Orthoptera) of Canton—Part I, External Morphology, by S. F. Chiu (pp 547–554); A Biological Study of an Orange-Brown Galerucid Pest [Probably *Rhaphidopalpi* (*Aulacophora*) *femoralis* Motsch.] of Cucurbits, by K. Chan (pp. 577–592); and A New Chinese *Scutellaria* [*inghokensis* n.sp.] and Notes on Gardenia, by F. P. Metcalf (pp. 593, 594).

No. 1.—A Galerucid Beetle [*Ceratia orientalis* Hornst] Injurious to Cucurbits, by K. Chan (pp. 103–107); Catalogue of the Phytophagous Beetles of China, by G. Liu (pp. 109–133) (see above); A New Whitefly from China [*Bemisia yanagicola* n.sp.] (Aleyrodidae, Homoptera), by R. Takahashi (pp. 137–141); The Life History of the Tortoise Beetle, *Metriona circumdata* Hbst. (Coleoptera, Cassididae), by K. C. Yeung (pp. 143–162); and The Life History of a Species of *Graptostethus* (Hemiptera, Lygaeidae) (pp. 171–176) and The Egg of the Lygaeid *Lygaeus hospes* Fabr. (Hemiptera) (p. 181), both by W. E. Hoffmann.

Trap collections of insects in cotton in 1932, J. C. GAINES (*Bul. Brooklyn Ent. Soc., 28 (1933), No. 2, pp. 47–54, fig. 1*).—This contribution from the Texas Experiment Station records the results of insects collected in traps set in cotton fields and examined at weekly intervals during the period from June 15 to August 31, 1932. A list given of the insects collected includes 199 species, representing 61 families, captured on a screen trap located in a cotton field in the Brazos River bottoms, Burleson County, Tex.

Insect and allied pests of cultivated mushrooms (*Ann. Appl. Biol., 21 (1934), No. 1, pp. 162–171*).—In a discussion of the enemies of mushrooms, the

incidence of attacks and their relation to growing practice is dealt with by S. G. Jary (pp. 162–167) and laboratory investigations are reported by M. D. Austin (pp. 167–171).

Avoiding residue in controlling raspberry beetle and saw-fly, R. HUTSON (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 183–185, figs. 2*).—Directions are given for the control of the raspberry fruit worm and the raspberry sawfly through the application of arsenicals without danger of residue.

The effect of hurricanes on pests attacking citrus trees in Florida, W. W. YOTHERS and R. L. MILLER (*Citrus Indus., 15 (1934), No. 1, pp. 6, 7*).—Observations conducted in Orange County, Fla., following the hurricane of September 4, 1933, are briefly summarized. It was found that when heavy rains (accompanied by violent winds, as in this hurricane) occur, the rust mites practically all disappear, but that the pest survives through the eggs that remain on the trees. It appears doubtful whether the rains accompanying a hurricane cause a very great mortality in the citrus white fly. It is the authors' opinion that there resulted from the hurricane a mortality of from 75 to 80 percent of Florida red scale, which is practically always on the fruit or leaves. Since the purple scale is primarily a branch and limb infesting form, the loss of foliage and fruit did not cause such a large proportion of this species to be killed; several examinations in different groves indicated that from 33 to 40 percent of the scales present were alive both before and after the hurricane.

Control of insects infesting stored food products in the home, E. I. McDANIEL (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 167–173, figs. 7*).—A practical account.

Insecticidal action in the nitrogen heterocyclic compounds, L. C. CRAIG and C. H. RICHARDSON (*Iowa State Col. Jour. Sci., 7 (1933), No. 4, pp. 477–485*).—The authors report upon a study made of "the relative toxicity of a group of 11 α-substituted *n*-methyl pyrrolidine compounds to the bean aphid (*Aphis rumicis*), in which the negativity of the substituted radicals as measured by the dissociation constants varied within the limits of 10^{-4} and 10^{-7}. The toxicities of most of these compounds for the goldfish (*Carassius aureus*) and for tadpoles of *Rana sylvatica* and their effect on the growth of lupine seedlings (*Lupinus albus*) are included for comparison. The compounds were made up in aqueous solution with 0.25 percent sodium oleate and administered as a fine spray to the adult wingless aphids. . . .

"*L*-nicotine is considerably more toxic to aphids than the optically inactive mixture (*dl*-nicotine). The recent literature on the toxic action of anabasine (*dl* (β-pyridyl)-*n*-piperidine) and its *n*-methyl derivative is discussed in relation to nicotine. These compounds appear to be less toxic to certain insects and less active physiologically to vertebrates than nicotine. They resemble neonicotine, their optically inactive isomer, in being about equally toxic with nicotine to aphids."

The contribution is accompanied by a list of 18 references to the literature.

The insecticidal action of some furan compounds, H. GILMAN, L. C. HECKERT, A. P. HEWLETT, and J. B. DICKEY (*Iowa State Col. Jour. Sci., 7 (1933), No. 4, pp. 419–428*).—This is a report of a preliminary study made of the insecticidal action on flies of some furan compounds.

A bibliography of chloropicrin, 1848–1932, R. C. ROARK (*U.S. Dept. Agr., Misc. Pub. 176 (1934), pp. 88*).—This annotated bibliography is a revision of the bibliography and supplements previously noted (E.S.R., 64, p. 157). A subject index is included.

Attempts to transmit the virus of acute anterior poliomyelitis through Aedes aegypti, J. S. SIMMONS, R. A. KELSER, and V. H. CORNELL (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 496–498*).—In the experiments con-

ducted the yellow-fever mosquito failed to transmit the virus of poliomyelitis from infected to normal monkeys.

Notes on the Thysanoptera found on citrus in Palestine, E. Rivnay (*Hadar, 6 (1933), No. 11, pp. 255–257, figs. 3*).—Of 17 species of thrips observed on citrus 8 were found but once, and 3 others, including *Franklinothrips myrmicaeformis* Zanon, *Karnyothrips longisetis* Bagn., and *Haplothrips andresi* Pr., are beneficial although scarce and of little economic importance. Of the remaining 6, *H. haemorrhoidalis* Bche. is the source of much damage to citrus fruit, especially in old, shady groves; the onion thrips causes much damage to citrus fruit, particularly to fruit the size of small walnuts; and *Taeniothrips discolor* Ka., *T. meridionalis* Pr., *Odontothrips karnyi rivnayi* Pr., and *Thrips major banaticus* Ka. are a source of injury to the fruit.

Some common species of the genus Thrips (Thysanoptera), E. R. Speyer (*Ann. Appl. Biol., 21 (1934), No. 1, pp. 120–152, pls. 2, figs. 9*).—The author here calls attention to the economic importance of the Thysanoptera as an order and the necessity for a revision of the classification. The range of variation, within the species, of characters which have in the past been used for the separation of species in the genus *Thrips* is illustrated. A general account of the biology and a more detailed account of that relating to some common species are given.

The bed bug (Cimex lectularius): Prevention of house infestation, W. C. Gunn (*Edinburgh: Dept. Health Scotland, 1933, pp. 20, pls. 8*).—This is a report of a study conducted for public health purposes.

Biological races in Psyllia mali Schmidberger, K. B. Lal (*Nature [London], 132 (1933), No. 3346, p. 934*).—The author's observations of the biology of Scottish Psyllidae have shown that in southeast Scotland *P. mali* (the apple sucker) regularly breeds on various species of *Crataegus* and is, in fact, identical with and only a seasonal form of *P. peregrina* Först, recorded from hawthorn. The two forms do not interbreed and are host specific. The author considers them to represent two biological races, namely *P. mali crataegi* bred on hawthorn and *P. mali mali* bred on apple. It is pointed out that while the hawthorn race is attacked by many chalcidoid and proctotrypoid parasites, the apple race is free from them. The only parasite common to both is a new species of *Endopsylla* (Cecidomyidae-Diptera) which oviposits on the wings of the adults, the larvae burrowing into the abdomen of the host.

Biology and control of tree hoppers injurious to fruit trees in the Pacific Northwest, M. A. Yothers (*U.S. Dept. Agr., Tech. Bul. 402 (1934), pp. 46, pls. 8, figs. 18*).—The author reports the results obtained in biological studies and orchard observations of and control experiments with four species of Membracidae, commonly known as "tree hoppers", conducted at Yakima, Wash., from 1923 to 1928 and of *Heliria rubidella* Ball at Wenatchee, Wash., from 1928 to 1932. The forms considered are *Stictocephala inermis* Fab., *Ceresa basalis* Walk., buffalo tree hopper, *C. albidosparsa* Stål and *H. rubidella*. The details of the work are presented in 18 tables, and a list is given of 35 references to the literature.

Considerable injury is caused to fruit trees each year by the egg-laying activities of these forms. In the nymphal stages the first four evidently feed upon alfalfa or sweetclover and possibly upon the succulent weeds growing in the orchard, to which they cause no noticeable injury. The damage caused results from the wounds cut into the twigs of fruit trees for the purpose of oviposition. They are deposited in apple, cherry, peach, pear, prune, willow, locust, poplar, and many other kinds of trees and shrubs. For the most part, 1- and 2-year-old wood was used for oviposition, the exception being that of the current sason's growth by *C. basalis*. Although the incisions are usually small,

there are so many of them in cases of severe infestation that the growth of the tree is retarded. This is especially serious with 1- and 2-year-old trees. In the case of *C. basalis* the deep wounds made for egg deposition in the terminal portions of the twigs often cause these twigs to wither and die back for several inches. The scars furnish suitable feeding places for the woolly apple aphid. The irritation caused by these aphids prevents the wounds from healing, and the unhealed wounds furnish entrance for fungus and other diseases.

"The insects winter over in the egg stage only. These eggs are deposited from July to early October and hatch in April and early May the following spring. Upon hatching, the nymphs, excepting those of *H. rubidella*, fall to the alfalfa or such other cover crop or weeds as may be present. There they feed and pass through 5 instars, reaching maturity late in June or July. The adults live about 60 days. *C. bubalus* deposits from 6 to 12 eggs in two short, parallel rows; *C. basalis*, about 20 eggs in straight, deep, longitudinal wounds; *S. inermis* deposits about 6 eggs in each tiny superficial scar; *C. albidosparsa* deposits eggs singly in buds; and *H. rubidella* deposits them singly in the bark.

"Besides these species, there are several others associated with them, some of which are not really distinguishable from them, but owing to their scarcity they are of little economic importance.

"Of the various methods of control suggested or tried, spraying the eggs with a 4 percent oil emulsion or miscible oil is the most practical and satisfactory measure. While it is rarely possible to kill all of the eggs, the dormant oils destroy enough to accomplish reasonable control. Such applications are regularly put on for the control of the San Jose scale and European red mite, and extra applications for the tree hopper eggs are unnecessary. Lime-sulfur proved ineffective. Clean cultivation is worth consideration as a last resort in cases of severe injury where the use of oil sprays is undesirable."

A note on the sugarcane leaf hopper (Pyrilla) in South Arcot district, C. B. Francis (*Madras Agr. Jour., 21 (1933), No. 12, pp. 510–514*).—An account of a leafhopper enemy (*Pyrilla*) of sugarcane, which has for the first time reached the status of a major pest in the South Arcot district in Madras.

The transmission of the Fiji disease of sugar cane by an insect vector, G. O. Ocfemia (*Univ. Philippines, Nat. and Appl. Sci. Bul., 3 (1933), No. 3, pp. 277–280*).—The author reports finding that the Fiji disease of sugarcane, apparently of virus origin, is transmitted from diseased plants to healthy canes by adults of the leafhopper *Perkinsiella vastatrix* Bred.

A promising control for psyllid yellows of potatoes, G. M. List and L. B. Daniels (*Science, 79 (1934), No. 2039, p. 79*).—In control work by the Colorado Experiment Station with the psyllid *Paratrioza cockerelli* Sulc., responsible for a condition of potatoes and tomatoes known as psyllid yellows and thought to be due to a toxin injected into the plant by this insect, estimated to have reduced the 1932 crop of potatoes in Colorado as much as 8,000,000 bu., the application of lime-sulfur as a spray has given outstanding results. This spray has shown a very definite lethal effect upon the insects and apparently has a positive residual effect in preventing the location of the small scalelike nymphs. Plants showing distinct psyllid yellows symptoms have after spraying shown almost complete recovery, as evidenced by a normal top growth and good tuber production.

"In an early field of the Irish Cobbler variety the checks produced at the rate of 51 bu. of marketable potatoes, while a block receiving only one application of lime-sulfur, testing 33° B. and used at the rate of 1 gal. to 40 gal. of water, produced at the rate of 209 bu. of much better quality and size. In another field the check produced at the rate of 128.9 bu. and the sprayed portion 378.5."

Aphides as vectors of "breaking" in tulips, II, A. W. McKenny Hughes (*Ann. Appl. Biol., 21 (1934), No. 1, pp. 112–119, pl. 1*).—In this second contribution (E.S.R., 65, p. 247) the author distinguishes three types of "breaking" in tulips, namely, "full", "self", and "clotted." The evidence points to full break being the product of two viruses. It was found that self breaking may be selectively transmitted by the green peach aphid and *Macrosiphum gei* Koch. Self break tulips only transmit self breaking. Clotting is an expression of full break in certain varieties. *Anuraphis tulipae* B. de Fonsc. is a definite vector in the bulb store but not on the growing plant.

Observations on the winter survival of plant lice in Iowa (Homoptera—Aphiidae), F. Andre and H. D. Tate (*Iowa State Col. Jour. Sci., 7 (1933), No. 4, pp. 499–503, fig. 1*).—While engaged in a study of the hibernation habits of hemipterous insects, the authors found in work at the Iowa Experiment Station that certain species of plant lice may overwinter in the northern part of the United States in the nymphal and adult stages of apterous and alate viviparae as well as in the egg stage. It is considered not unlikely that spring and early summer injury by the aphids may be more or less correlated with winter survival of viviparous forms. Since all stages of viviparae of some species are able to survive the winter and to continue their activities in the spring it is considered possible that they may serve as overwintering reservoirs for plant viruses.

As an indication of the number of aphids that may survive in a given area, the authors cite the findings in 4 sq. ft. of moss, which upon being loosened about 1 in. below the ground, rolled up in a carpetlike manner, and placed in collecting funnels produced 1 alate and 2 apterous viviparae and 4 nymphs. It is pointed out that bluegrass sod is also a suitable medium from which to obtain overwintering individuals, since in several instances from 3 to 5 plant lice were collected in an area containing approximately 3 sq. ft. on the college grounds at Ames.

Based on these findings, the number of aphids that survive in favorable overwintering areas may be well above 75,000 to the acre. It is pointed out, however, that winter survival of summer forms is greatly influenced by the fall and winter aspect of the surrounding vegetation.

Bibliography of lac, A. C. Chatterjee (*Calcutta: Indian Lac Cess Com., 1933, pp. 129*).—This bibliography relates in large part to Indian lac, a resin formed by the scale insect *Laccifer* (*Tachardia*) *lacca* Kerr.

Icerya purchasi Mask. and its control in Palestine, F. S. Bodenheimer and B. Tenebaum (*Hadar, 6 (1933), No. 2, pp. 32–34, figs. 2*).—A brief account is given of the biology of the cottony-cushion scale, its predacious enemy the vedalia, and control measures.

Spraying versus fumigation in red scale control, F. S. Bodenheimer (*Hadar, 6 (1933), No. 12, pp. 285, 286*).—The author concludes that in controlling the California red scale both spraying and fumigation are necessary, and that the introduction of liquid hydrocyanic acid gas is an important step in the progress of the citrus industry in Palestine.

Studies of hypersensitiveness to the emanations of caddis flies (Trichoptera).—IV, Diagnosis and treatment of forty-three cases of asthma and hay fever, S. J. Parlato (*Jour. Amer. Med. Assoc., 102 (1934), No. 12, pp. 910–913, figs. 5*).—This is a report of studies of the action of hairs of the caddis fly, which if inhaled cause allergic symptoms. In a series of 850 allergic patients tested during the years 1928–32, 5 percent were found to be hypersensitive to the caddis fly. The results obtained from inoculations of 32 patients with a caddis fly extract indicate that specific treatment can be effec-

tively given during as well as before the fly season, although the latter is recommended. The desensitization has endured as long as four years. It is believed that one course of treatment will render a patient permanently free from allergic symptoms.

The "nettlegrub" pests of tea, S. ANANDA RAO (*Planters' Chron., 29 (1934), No. 2, pp. 30–39*).—Information is presented on the life history and habits of the nettle grubs, mainly in Ceylon, including the life history of *Thosea cervina*, their natural enemies, and control measures. A brief account of a fungus disease of the nettle grubs or limacodids caused by *Cordyceps* sp., by M. K. Subba Rao, is appended (pp. 38, 39).

The food plant of Pyrausta machaeralis Wlk. in Java [trans. title], L. G. E. KALSHOVEN (*Tectona (Boschbouwk. Tijdschr.), 27 (1934), No. 1, pp. 71–75; Eng. abs., pp. 74, 75*).—The author reports having obtained *P. machaeralis* and *P. machaeralis rubicundalis* from the shrub *Callicarpa cana*, the observations indicating that teak is not the natural food plant of this species in Java.

Baits for oriental fruit moth, S. W. FROST (*Pennsylvania Sta. Bul. 301 (1933), pp. 35, figs. 11*).—This report of studies of the use of baits for the oriental fruit moth brings together the results of studies conducted by the station extending over a number of years, presented in connection with a five-page list of references to the literature on liquid baits. Details of the work are presented in tabular and chart form.

The evidence accumulated indicates that baiting materially reduces the oriental fruit moth infestation. The use of sirups containing a 1:20 dilution of medium or high grade material gives the largest catch of moths. The addition of other materials, as methyl allephenol, citral, etc., increases the attractiveness of sugar baits. Baits are effective, without change, for from 4 to 8 weeks. When it is not practicable to add water at weekly intervals, the life of a bait is about 5 weeks. Aluminum coated tin or enameled traps are satisfactory; they will last for 3 or more years. The cost of baiting should not exceed $8 an acre.

The southern corn stalk borer (Diatraea crambidoides (Grote)) in South Carolina, O. L. CARTWRIGHT (*South Carolina Sta. Bul. 294 (1934), pp. 32, figs. 14*).—This is a report of studies of the history, biology, and control of the southern corn stalk borer. This is one of the most important corn insects in South Carolina, only the rice weevil equaling or surpassing its destructiveness and abundance in the State at the present time. It occurs in every county in the State, and caused a loss of 15 percent of the corn crop in 1931, a not unusual year.

"A State-wide survey revealed 51.64 percent of the stalks injured and 32.46 hibernating borers per hundred stalks in that year. Biological studies showed an average oviposition of 306.2 eggs over an average period of 5.24 days. Normal oviposition probably totaled between 375 and 400 eggs. Maximum oviposition was 664 eggs. Incubation varied from 4 days at 87° F. to 8 days at 70° average daily mean temperature. Average incubation was 6 days. Pupal periods were 7 to 28 days at average daily mean temperatures of 85° to 67°. Average pupal period was 11.9 days. Field pupation in November under unusual conditions was recorded in 6 counties. Minimum developmental period egg to adult, 36 days; maximum (not hibernating), 76 days; average, 50 days. One and two broods are usual at Clemson College while two and three occur at Florence. All stages appear about 10 days later at Clemson College than at Florence. Nine natural enemies are listed. Destruction of stalks immediately after harvest, fall and spring plowing of stubble, late planting dates, rotation, and cooperation are recommended as control measures."

The southwestern corn borer, E. G. DAVIS, J. R. HORTON, C. H. GABLE, E. V. WALTER, R. A. BLANCHARD, and C. HEINRICH (*U.S. Dept. Agr., Tech. Bul. 388 (1933), pp. 62, figs. 28*).—The southwestern corn borer here considered, described from Guadalajara, Mex., in 1911, was first reported in 1913 as occurring in the southwestern part of the United States. Now distributed over a considerable area in the southwestern part of the United States, including the southeastern corner of Arizona, nearly the southeastern two thirds of New Mexico, most of the Panhandle and Big Bend districts of western Texas, about two thirds of the Oklahoma Panhandle, the extreme southeastern corner of Colorado, and the extreme southwestern corner of Kansas, it is extending its limits toward the main corn area. Corn is the only crop severely damaged, although closely related plants are attacked. All parts of the corn plant are injured, stalk tunneling being the most serious. The field damage may range from a slight to a complete loss of the crop.

This insect has two generations and a partial third, the winter being passed as full-grown larvae in the tips of the main stalks. The soiled white moths lay their small flattened eggs in masses on the leaves and stalks of the corn plants. The young larvae feed for a time on the leaves and then tunnel into the stalks. When full grown the summer-form larvae are milky white with dark spots about the setae. Pupation takes place in the tunnels of the host plant.

The egg parasite, *Trichogramma minutum* Riley, and the larval parasite, *Apanteles diatraeae* Mues., are effective in reducing the borer during the latter part of the season. Cultural control methods, such as advantageous time of planting, clean farming, plowing and working stubble fields in the fall, etc., have proved effective in reducing its damage.

A list is given of 13 references to the literature.

Experimental infection of anopheline mosquitoes, M. O. T. IYENGAR (*Indian Jour. Med. Res., 20 (1933), No. 3, pp. 841–861*).—In experimental infection with species of *Anopheles* by feeding laboratory-bred individuals on gametocyte carriers seven were found susceptible to experimental infection with *Plasmodium falciparum*, namely, *A. aconitus* Dön., *A. fuliginosus* Giles, *A. jamesi* Theob., *A. ludlowi sundaica* Rodenw., *A. minimus* Theob., *A. stephensi* Liston, and *A. varuna* Iyengar. Of these, *A. fuliginosus* appeared to be less susceptible to infection than the other species. Six species of *Anopheles* were observed to be susceptible to infection with *P. vivax*, namely, *A. aconitus*, *A. fuliginosus*, *A. hyrcanus nigerrimus* Giles, *A. minimus*, *A. stephensi*, and *A. varuna*. Of these, *A. hyrcanus* showed the least susceptibility to infection. Four species were observed to be susceptible to infection with *P. malariae*, namely, *A. culicifacies* Giles, *A. ludlowi*, *A. stephensi*, and *A. varuna*. Sporozoite infections of the salivary glands were observed in two species, *A. ludlowi* and *A. stephensi*.

Soap as a mosquito larvicide, J. M. GINSBURG (*Science, 79 (1934), No. 2044, p. 210*).—In tests conducted at the New Jersey Experiment Stations of a liquid soap consisting of a mixture of potassium oleate and coconut oil soap containing about 40 percent of actual soap, concentrations of 0.2 percent or higher gave 100 percent kill of larvae and pupae of the common house mosquito *Culex pipiens*. It is pointed out that the use of soap as a larvicide in treating clear standing water, fire barrels, etc., may be of value where applications of oil or larvicides containing toxic or inflammable chemicals are objectionable.

A method of making slide smears from female Anopheles, for examination for sporozoites of malaria parasites, and of preserving the mosquitoes for reference, P. J. BARRAUD (*Indian Jour. Med. Res., 21 (1933), No. 2,*

pp. 451–454, figs. 2).—This is a description of a method which can be carried out in the field, where laboratory facilities and sufficient time for dissections in the ordinary way are not available.

The longevity of females of Culex fatigans under experimental conditions, and the duration of malarial infections in these insects, S. A. Majid and J. A. Sinton (*Indian Jour. Med. Res., 21 (1933), No. 2, pp. 455–466*).—The experiments reported, presented in connection with a list of 12 references to the literature, indicate that after a single infective feed a mosquito may transmit the malarial parasite for a period as long as 8 weeks if kept at a relatively high temperature most of the time. "If the infected mosquitoes are kept for the majority of their lives at comparatively low temperatures, sufficient to inhibit or retard the growth of the parasite, the salivary glands may be continually replenished with fresh sporozoites derived from oocysts maturing during periods of more suitable temperature. Under such conditions, infections may be transmitted as late as 102 days after the primary infective feed.

"The sequence of events appears to be different when, after an infective feed, mosquitoes are kept under temperature conditions favorable to a comparatively rapid maturation of all the oocysts and an invasion of the salivary glands with sporozoites. Under such conditions there seems to be a tendency for the sporozoites to lose their infecting power after about 8 or 9 weeks. Even although they are found to be actively motile and show no detectable abnormality, they may not be infective. In *C. fatigans* active, but apparently noninfective, sporozoites are detectable as late as 166 days after a single infective feed, and nonmotile sporozoites as late as 210 days. If a mosquito be given periodical feeds of infective blood, the duration of infectivity in the insect would appear to be limited only by its span of life. In the absence of replenishment of the glands, biting appears to deplete the stock of sporozoites."

Notes on the larval feeding habits and the life history of Eumerus tuberculatus Rondani, C. H. Martin (*Bul. Brooklyn Ent. Soc., 29 (1934), No. 1, pp. 27–36, pls. 2*).—Observations, particularly of the lesser bulb fly, conducted on Long Island, are reported. The lesser bulb fly lays its eggs in the soil near the bulb or upon the leaves of the bulb just beneath the surface of the soil, usually in dry or slightly moist places.

"Newly hatched larvae were not able to cut through the unbroken epidermis of either healthy or decayed bulbs. They were, however, able to enter dormant bulb tissue after it was soaked and broken. Decayed tissue seemed to be preferred by the larvae and is probably necessary for their development. The developmental period for larvae in decayed tissue was 5.3±0.6 days shorter than for larvae beginning their development in healthy tissue which later decayed. Apparently not much development took place until the bulb tissue began to decay. Temperature had about the same effect upon the length of the egg and of the pupal stages. The length of the pupal period was the same for both sexes. The peak of emergence appeared to be during the morning hours."

Zenillia libatrix Panzer, a tachinid parasite of the gypsy moth and the brown-tail moth, P. B. Dowden (*Jour. Agr. Res. [U.S.], 48 (1934), No. 2, pp. 97–114, figs. 4*).—In this contribution the author presents the results of a study of a leaf-ovipositing tachinid that is common throughout Europe, where it is a parasite of minor importance of the gypsy moth, brown-tail moth, and satin moth and attacks many other species of lepidopterous larvae. Small numbers of the parasite were liberated in New England from 1906 to 1910 and 1927 to 1932, but thus far it has not been recovered. It appears that while this tachinid has thus far been of but slight economic importance as a parasite of

the gypsy moth, brown-tail moth, and satin moth, it might become important under certain favorable conditions.

Studies have shown that it has two generations a year and possibly a partial third. The winter is spent as a first-instar or a second-instar larva within the host pupa. The first generation is completed on the gypsy moth or some other host available during May, June, and early July. A second generation may be completed in August, but probably larvae of the second generation hibernate. The parasite has been reared in the spring from larvae of *Pygaera pigra* Hufn. collected in the field in October. As many as five *Z. libatrix* larvae may complete development in a single specimen of the gypsy moth, although usually only one parasite issues from a host.

The effectiveness of the parasite seems to be limited by its polyphagous habits, the fact that it is double-brooded, and its slow larval development, which makes it a poor competitor of other larval parasites. It has been found to overwinter at the laboratory in a common native species, *Melalopha inclusa*.

A list is given of 18 references to the literature.

Description of Aplomyiopsis galerucellae n.g. and sp. (Tachinidae), parasite of Galerucella luteola (F. Müll.) in North America [trans. title], J. Villeneuve de Janti (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 27 (1932–33), pp. 125, 126*).—This is a description of a tachinid parasite of the elm leaf beetle collected by F. Silvestri at Medford, Oreg.

Mediterranean fruit fly control in eastern Morocco [trans. title], E. Vivet (*Rev. Agr. Afrique Nord, 30 (1933), No. 734, pp. 532, 533; abs. in Hadar, 6 (1933), No. 10, pp. 241, 242*).—An account is given of control work with the Mediterranean fruit fly commenced in the Beni Snassen region of eastern Morocco in 1932 through the use of traps. At the close of May of that year 13,000 had been distributed in fruit orchards, the results proving quite satisfactory. As a result, 100,000 traps were introduced into the orange groves of that region in 1933. The bait mixture employed was composed of 5.5 kg of flour, 5.5 kg of borax, and 200 mg of sodium arsenate dissolved in 100 l of water, directions being given for its preparation. One trap was attached to most fruit trees and to peach and apricot trees two or more traps. It is reported that in the Berkane region, where in the previous years it was impossible to obtain a sound apricot, only 5 percent of the fruit was infested in 1932. Good results were likewise obtained with the clementine, the pest being completely eliminated from this fruit. The traps were also found to give good results in Algeria.

Studies on the higher Diptera of medical and veterinary importance: A revision of the species of the genus Musca based on a comparative study of the male terminalia, I, II, W. S. Patton (*Ann. Trop. Med. and Parasitol., 26 (1932), No. 3, pp. 347–405, figs. 26; 27 (1933), Nos. 2, pp. 327–345, figs. 6; 3, pp. 397–430, figs. 16*).—The first part of this contribution deals with the natural grouping of the species and their relationship to each other (pp. 347–405), and the second part consists of a practical guide to the Palearctic species (pp. 327–345, 397–430).

Studies on the higher Diptera of medical and veterinary importance: A revision of the genera of the tribe Muscini, subfamily Muscinae, based on a comparative study of the male terminalia, I, II, W. S. Patton (*Ann. Trop. Med. and Parasitol., 27 (1933), Nos. 1, pp. 135–156, figs. 11; 4, pp. 501–537, figs. 15*).—The first part of this contribution deals with the genus *Musca* (pp. 135–156) and the second part with the genus Stomoxys (pp. 501–537).

Studies on the higher Diptera of medical and veterinary importance: Cochliomyia americana sp. nov., the screw-worm fly of the New World, E. C. Cushing and W. S. Patton (*Ann. Trop. Med. and Parasitol., 27 (1933),*

No. 4, pp. 539–551, figs. 7).—Under the name *C. americana* n.sp. the authors describe what they consider to be the true screw worm fly of North America, its identity having been obscured by the close resemblance to *C. macellaria* (the screw worm). The male and female terminalia are described and compared with those of *C. macellaria*. The authors suggest that it is a true specific myiasis-producing fly, like *C. bezziana*. It is thought that a Mexican myiasis-producing calliphorine larva here described may be the larva of *C. americana*

A promising new blowfly dressing, R. N. McCulloch (*Agr. Gaz. N.S. Wales, 44 (1933), No. 9, pp. 711, 712*).—Of the larvicide dressings tested paris green-kaolin paste gave the best results. It was made by mixing dry 0.5 oz. of paris green in 5.5 oz. of kaolin, placing the dust in a bottle and adding slightly less than 1 pt. (18 oz.) of soft soap solution (1 or 2 percent), and shaking vigorously.

Development of a standard cage method for testing the effectiveness of stomach-poison insecticides on the Japanese beetle, W. E. Fleming (*Jour. Agr. Res.* [*U.S.*], *48 (1934), No. 2, pp. 115–130, figs. 7*).—A description is given of a special glass cage which has no resting places at the top or sides and in which the beetle is attracted to the plants, developed while engaged in the course of studies of the effectiveness of stomach poison insecticides against the Japanese beetle. Comparable results were obtained in successive tests with the same materials at a temperature of 85° to 90° F. and a relative humidity of 90 to 95 percent under artificial yellow light of an intensity of 85 candle meters.

The author has found a group of 200 individuals to be a convenient unit for conducting stomach poison insecticide tests with the Japanese beetle. The results thus obtained with commercial acid lead arsenate are said to confirm the conclusion that this compound is an effective stomach poison insecticide for this beetle. The concentration of the arsenical governs the extent of feeding on the foliage and for a certain period the mortality of the beetles, but at the end of this period mortality is independent of the lead arsenate concentration.

A list is given of 13 references to the literature.

Notes on the habits of June beetles in Iowa (Phyllophaga—Coleoptera), B. V. Travis (*Iowa State Col. Jour. Sci., 7 (1933), No 4, pp. 397–406, fig. 1*).—This contribution from the Iowa Experiment Station reports upon experimental work conducted in various parts of Iowa during the spring and summer of 1932. "It includes observations on evening and morning flights of beetles, notes on copulation, and results of some light trap studies. Collection data are presented on the following species: *Phyllophaga hirticula* (Knoch), *P. tristis* (Fab.), *P. futilis* (Lec.), *P. fusca* (Froel.), *P. rugosa* (Mels.), *P. hornii* (Sm.), *P. inversa* (Horn), *P. vehemens* (Horn), *P. implicita* (Horn), *P. ilicis* (Knoch), *P. marginalis* (Lec.), *P. micans* (Knoch), *P. congrua* (Lec.), *P. crenulata* (Froel.), *P. prunina* (Lec.), *P. drakii* (Kby.), *P. nitida* (Lec.), *P. forsteri* (Burm.), *P. balia* (Say), *P. fraterna* Harr., and *P. vilifrons* Lec." The details are presented in tabular form.

A study on the use of arsenical dust for the control of June beetles, B. V. Travis and G. C. Decker (*Iowa State Col. Jour. Sci., 7 (1933), No. 4, pp. 493–498, fig. 1*).—In experiments conducted by the Iowa Experiment Station it was evident "that the beetles were killed by eating poisoned food and not by ingesting free dust from the surface of the leaves or from their appendages. Males appeared to be more susceptible to arsenical poisoning than females. When the temperature was too low to induce normal feeding, good results could not be secured. Moderate and heavy applications of calcium arsenate killed from 65 to 100 percent of the beetles in less than 72 hr. There was a direct correlation between the rate of application of the dust and the time required to

kill the beetles. Undusted foliage was readily consumed, whereas poisoned leaves were eaten only sparingly."

On the biology of Psylliodes hyoscyami Linn. (Chrysomelidae, Coleoptera), the henbane flea-beetle, with descriptions of the larval stages, H. C. F. Newton (*Ann. Appl. Biol., 21 (1934), No. 1, pp. 153–161, pls. 2, figs. 3*).—The author records a severe attack by the flea beetle *P. hyoscyami* on *Hyoscyamus niger* grown as a commercial crop, the life history and developmental stages of the beetle being described. Suggestions are made for its control. Larvae of *Lonchaea flavidipennis* Zett. (Sapromyzidae, Diptera) have been found associated with the beetle larvae in the damaged stems.

***Contribution to the knowledge of the Cerambycidae of the Japanese* Empire** [trans. title], M. Matsushita (*Jour. Faculty Agr., Hokkaido Imp. Univ., 34 (1933), No. 2, pp. 157–445+X, pls. 5*).—In this monographic account the author recognizes 258 genera, represented by 684 species, 9 subspecies, and 30 varieties, of which 16 genera are erected and 91 species, 2 subspecies, and 8 varieties are described as new.

Contribution to the knowledge of the morphology and biology of the cadelle, Tenebroides mauritanicus L. [trans. title], G. S. Candura (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 27 (1932–33), pp. 1–56, figs. 18*).—This report of the author's study of the cadelle is presented in connection with an eight-page list of references to the literature.

Observations on the general biology of the flour beetle, Tribolium confusum, T. Park (*Quart. Rev. Biol., 9 (1934), No. 1, pp. 36–54, figs. 5*).—This contribution on the confused flour beetle is presented in connection with a list of 39 references to the literature.

Observations on the palm weevil "Rhynchophorus ferrugineus F" as a pest of coconuts in Cochin, C. S. Venkatsubhan (*Poona Agr. Col. Mag., 25 (1934), No. 4, pp. 147–149*).—A discussion of the status of this weevil, which continues to be of slight economic importance.

Control of the orchid weevil Diorymerellus laevimargo Champ., C. C. Hamilton and K. Henderson (*Amer. Orchid Soc. Bul., 2 (1933), No. 3, pp. 42–50, figs. 6*).—This contribution from the New Jersey Experiment Stations and the Thomas Young Nurseries, cooperating, deals with the control of *D. laevimargo*, a weevil first observed in New Jersey injuring various species of *Cattleya* and *Dendrobium* about 1916. This weevil, which appears to be quite generally distributed wherever orchids are grown and was probably introduced with plants from the Tropics, has become a source of considerable damage through its feeding upon the buds and bloom of orchids. Although the actual amount of feeding is slight, damage is severe as the market value of the bloom is destroyed.

The results of preliminary control work have been presented in the annual report of the station for 1931 (E.S.R., 67, p. 561). Of the materials tested, only naphthalene and paradichlorobenzene proved to be at all effective against the beetles and at the same time caused no injury to the roots of the orchid plants or the peat. The naphthalene treatments gave as a rule less than 50 percent control, while the paradichlorobenzene gave a control of from 95 to 100 percent. When 2 g of paradichlorobenzene were scattered uniformly over the peat surrounding the orchids, a satisfactory control was obtained. The kill obtained from the application of paradichlorobenzene was more rapid in the house where the temperature ranged from 75° to 80° F.

Apple curculio, C. E. Petch (*Pomol. and Fruit Growing Soc. Quebec, Ann. Rpt., 39 (1932), pp. 13, 14*).—A brief statement of the status of the apple curculio in the Province of Quebec.

Palestinian honey-yielding plants, A. EIG (*Hadar, 6 (1933), Nos. 3, pp. 60–62; 4, pp. 94–96*).—A discussion presented to apiculturists in January 1933.

The capture and stinging of the prey of Sphex xanthopterus (Cam.), C. H. HICKS (*Bul. South. Calif. Acad. Sci., 33 (1934), No. 1, pp. 39–41*).—This is a brief report of observations of the habits of the digger wasp *S. xanthopterus* in capturing its prey as observed near Los Angeles.

The introduction into Italy of an American hymenopterous parasite of the oriental fruit moth [trans. title], G. GRANDI (*Italia Agr., 70 (1933), No. 11, pp. 1077–1080, fig. 1*).—This contribution relates to the introduction of *Macrocentrus ancylivorus* Roh. into Italy from the United States.

ANIMAL PRODUCTION

[Experiments with livestock in Indiana] (*Indiana Sta. Rpt. 1933, pp. 15, 16–18, 40, 41–43, 46, 47, 49, 55, 56, figs. 5*).—Results obtained in tests with swine are reported on the feeding value of different tankages, the excessive consumption of roasted soybeans due to undue palatability, shrinkage of hogs as increased with length of truck haul, the effectiveness of intensive hog production with small herds, and feeding hogs on pasture.

In lamb tests information was obtained on succulent pastures for economical production, feeding before the pasture season, maintaining succulent pastures, protein supplements, and a comparison of timothy pasture and mixtures of timothy and clover pastures in the production of native lambs.

For cattle results are reported on the roasting of soybeans for calves, and the effect of limestone as influenced by the other ingredients of rations.

The poultry tests brought results on poultry house ventilation, soybean oil meal in rations for chicks, wheat and oats as substitutes for bran and middlings in chick rations, the relative value of dried milk and dried whey, alfalfa leaf meal in rations for chicks, inheritance of rate of growth, dressing percentages of turkeys, soybean oil meal in young turkey rations, young and old turkeys as breeders, and electric brooding at the Moses Fell Annex Farm.

Other studies yielded information on the feeding value of alfalfa hay as affected by maturity and method of curing, the nutritive value and mineral deficiency of soybeans and soybean products, and the cystine deficiency of soybeans.

[Investigations with livestock in Michigan], G. A. BROWN, E. L. ANTHONY, and C. G. CARD (*Michigan Sta. Rpt. 1933, pp. 174–177, 219, 246–248*).—Information obtained in livestock studies is reported on a comparison of self-feeding and hand-feeding for fattening lambs; the value of various bulky feeds for mixing with grains for self-fed lambs; the use of limited grain rations for wintering ewes; the value of ground home-grown second-cutting alfalfa for replacing tankage in a ration of brood sows; a comparison of ground barley, ground wheat of three different degrees of fineness, soaked whole wheat, and shelled corn for fattening swine; a comparison of ground barley, ground wheat, and ground wheat and oats with and without tankage for fattening pigs on rape pasture; a comparison of corn silage, shock corn, and ground shock corn from similar acreages for fattening steers; the effect of liberal, conservative, and limited rations of farm grains on the final development of colts; the value of whole and chopped shock corn for wintering colts; and the lack of antidotal effect of yeast on gossypol poisoning in pigs and rats.

In poultry experiments results were obtained on the effect of artificial heat on egg production of pullets during the winter months, the value of barley as a substitute for corn in the ration of laying hens and baby chicks, and the effects of temperature on incidence of pullorum disease.

[Experiments with livestock in New Mexico] (*New Mexico Sta. Rpt. 1933, pp. 29–31, 32, 33, 69–71*).—Information obtained in studies with livestock not previously noted are reported on a feeding comparison of ground corn fodder, ground hegari fodder, and corn silage for fattening lambs; and a comparison of ground corn fodder, ground corn fodder and alfalfa hay, and alfalfa hay and corn silage for fattening steers.

With poultry results were obtained in comparisons of gluten meal, cottonseed meal, meat and bone scrap, and alfalfa leaf meal.

[Experiments with livestock in Washington] (*Washington Sta. Bul. 291 (1934), pp. 19–22, 24, 25, 53, 54*).—Data are reported on wheat for fattening calves, by H. Hackedorn and R. McCall; raw v. cooked potatoes for fattening hogs, by G. B. Swier; comparative values of various succulent feeds, including cull potatoes, apples, corn silage, squash, carrots, and rutabagas, for fattening lambs, by Hackedorn, H. P. Singleton, and J. Sotola; the biological value of the proteins in alfalfa leaves and stems and digestion coefficients of nutrients in stems and leaves, and the effect of plant maturity on the nutritive value of Markton oat hay, both by Sotola.

In poultry studies, information was obtained on the nature of watery whites in eggs, by J. L. St. John and A. B. Caster; herring meal as a protein supplement, by St. John and O. Johnson; and composition of eggshells from rachitic and normal birds, by St. John, R. H. Johnson, and A. Brunstad.

Composition of Montana feeds and forages, J. Green (*Montana Sta. Bul. 283 (1934), pp. 23, figs. 4*).—This bulletin summarizes the results of several years' work on the proximate analyses of Montana feeds and forages.

"The protein of Montana feeds is generally higher than that of feeds of many other States; on the other hand, ether extract is lower in all the groups compared. The outstanding difference is in the ash content. Of all the groups compared, Montana feeds are almost one percent higher in ash. This may appear a small difference, but it represents one sixth of the total ash in the feeds. . . . The average crude fiber of Montana feeds is very nearly equal to that of the feeds from other States, and the difference in nitrogen-free extract is also small."

The feeding value of tung-seed meal, W. Godden (*Bul. Imp. Inst. [London], 31 (1933), No. 3, pp. 352–358*).—Chemical analyses of tung oil cake and extracted meal at the Rowett Research Institute, Aberdeen, Scotland, showed them to be fairly rich in protein and carbohydrates. However, feeding trials with rats, poultry, cattle, and pigs revealed that the meal contained a substance which made it unpalatable. An irritant material was also present in the meal which had a harmful effect upon the mucous membranes of the intestines.

The nutritive value of pure fatty acid esters, W. M. Cox, Jr. (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 777–790, figs. 5*).—In this study with white rats fed esters fractionated from coconut oil the author shows that mixed ethyl esters permitted as good growth as did mixed triglycerides. When individual saturated fatty acid esters supplied 77 percent of the caloric intake, nutrition was in no case equal to that obtained with mixtures of esters.

Death occurred when ethyl butyrate and ethyl caproate were included in the ration because the rats usually refused to eat them. Ethyl palmitate and ethyl stearate did not support life because of inadequate absorption. When ethyl caprate or ethyl laurate were fed the rats died suddenly within two weeks. This toxicity was a function of the weight of the rat and of the level at which the fat was fed. No characteristic chemical, bacteriological, or pathological changes were observed in the animals. The saturated fatty

acids with chains shorter than 10 carbon atoms failed to appear to any marked extent in the body fat of rats, in contrast to the longer chain acids which appeared regularly.

Inspection of commercial feedstuffs, P. H. Smith et al. (*Massachusetts Sta. Control. Ser. Bul. 70 (1933), pp. 56*).—This is the usual report of the official chemical and microscopical analyses of 1,649 samples of feeding stuffs intended for livestock and poultry consumption, collected during the year ended September 1, 1933 (E.S.R., 68, p. 798).

Commercial feeding stuffs, September 1, 1932, to August 31, 1933, F. D. Fuller and J. Sullivan (*Texas Sta. Bul. 488 (1933), pp. 228*).—Guaranteed and found analyses and the results of microscopical examination of 2,651 samples of feeding stuffs officially inspected (E.S.R., 69, p. 90) are reported.

The distribution of a reducing substance (vitamin C) in the tissues of fluorine-fed cows, P. H. Phillips and F. J. Stare (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 351–358*).—Data obtained in studies at the Wisconsin Experiment Station showed that vitamin C has a wide distribution in the animal body. It was quite low in the striated and heart muscles, but remarkably high in the suprarenal cortex and the anterior lobe of the hypophysis. Fluorine toxicosis appeared to increase the vitamin C content of certain actively metabolizing cells. When dairy cattle ingested 0.088 percent fluorine with their grain ration, an increase in vitamin C content was observed in the kidney, liver, anterior lobe of the hypophysis, and the suprarenal cortex. Chronic fluorine toxicosis disturbed the normal cellular respiration in the cortical tissue of the suprarenal gland. The total respiration was lowered as indicated by oxygen uptake measurements, and the anaerobic phase of respiration was markedly increased as indicated by the effect of cyanide upon the oxygen uptake.

The use of carbon dioxide in the storage of chilled beef, W. A. Empey and J. R. Vickery (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 4, pp. 233–243*).—In this study it was found that various strains of *Achromobacter* were the chief cause of losses in chilled beef stored for long periods. The length of safe storage, both in carbon dioxide and in air, was largely determined by the numbers of bacteria acquired by the beef during processing and initial chilling and capable of relatively rapid multiplication at −1° C. (30.2° F.)

The use of from 10 to 12 percent of carbon dioxide in the storage environment increased the length of the storage period approximately 40 percent without appreciable deterioration of the beef as compared with similar conditions of storage in air. When strict hygienic conditions were observed during slaughtering, dressing, and chilling, beef could be held in a chilled condition for 53 days if 12 percent of carbon dioxide was employed in the storage environment, and the main source of initial infection was *Achromobacter*.

An examination of the amount of iodine in the thyroid glands of Australian Merino sheep, M. C. Dawbarn and F. C. Farr (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 3, pp. 179, 180*).—The results of analyses of the thyroid glands of Australian Merino sheep are reported in this paper.

An experiment on the effect of an iodised lick on the growth and wool of the Australian Merino sheep, E. W. L. Lines (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 3, pp. 181–188, figs. 2*).—A study carried out in New South Wales showed that increasing the iodine intake by an average of 185γ per day for 47 weeks had no significant effect on the growth or wool production of lambs in the Moree district. The average iodine content of the thyroids of 101 sheep receiving iodized lick was 0.6 percent, while that of 70 glands from controls was 0.55 percent. This difference was not significant.

Appended is a note on soil types by R. G. Thomas for the section in which the study was conducted.

The effect on the body-weight and wool production of Merino sheep of adding sulphur to the diet, A. W. PEIRCE (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 4, pp. 294–298*).—Administering 2 g of sulfur per animal per day for a period of 7 mo. failed to increase the wool production of mature sheep in tests by the Council for Scientific and Industrial Research.

Flushing and winter grain feeding results with sheep, S. L. SMITH (*Natl. Wool Grower, 23 (1933), No. 9, pp. 17–19*).—In cooperation with the Montana Experiment Station, the U.S. Range Livestock Experiment Station at Miles City, Mont., found that good fresh range was probably as effective as supplemental grain feeding for producing a flushed condition of breeding ewes. Due to adverse weather conditions, a true flushed condition approximating a gain of 10 lb. per ewe for 3 weeks prior to and during the breeding season was not attained in the course of this test. Supplemental feeding on the range of the breeding band in the fall made the ewes less susceptible to adverse winter weather. Winter feeding of limited amounts of grain made it possible to keep the band on the range without using hay during most winters.

Silage for bred ewes, W. G. KAMMLADE (*Natl. Wool Grower, 23 (1933), No. 11, pp. 11, 12*).—A total of 102 range Corriedale ewes bred to Hampshire rams were divided into four lots at the Illinois Experiment Station to compare the value of corn silage and alfalfa hay for bred ewes. Part of the ewes were bred to lamb early and part to lamb late. Lots 1 and 3 were fed grain and alfalfa hay, while lots 2 and 4 received grain, corn silage, soybean oil mean, and steamed bone meal. Silage was fed for 56 days before lambing to lot 2 and for 124 days to lot 4.

Aside from four abortions in lot 2, believed to be caused by the sudden change in ration after the middle of the pregnancy period, the supplemented silage ration was equal, if not superior, to the alfalfa hay ration. Ewes fed silage gained more up to lambing than ewes fed alfalfa. The lambs were equal in vigor in all lots at birth, and there was no significant difference in the weights of the lambs or in the fleece weights of the ewes. At the prices charged for feeds the silage ration was the more economical.

Self-feeding versus hand-feeding fattening lambs, G. A. BROWN (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 160–162*).—The data presented in this study are based on the average results of five tests (E.S.R., 70, p. 76). A total of 117 lambs was hand-fed shelled corn and first-cutting alfalfa hay, while 110 lambs were self-fed the same feeds. The average length of the feeding period was 83.2 and 79.4 days, and the average gain per lamb was 30.5 and 29.7 lb. in the respective lots during these periods. Each 100 lb. of gain produced by hand-feeding required 45.5 fewer pounds of corn and 123 lb. more hay than when self-feeding was practiced. The self-fed lambs were somewhat better finished than the hand-fed lambs, but the latter were able to meet market requirements. There was greater danger of losses when lambs were self-fed than when they were hand-fed.

Appended is a table showing the feed cost per 100 lb. gain with hay and grain at varying prices.

Small grains and supplements for fattening fall pigs, L. VINKE and B. BERGSTEDT (*Montana Sta. Bul. 284 (1934), pp. 23, figs. 3*).—Continuing the studies at the Northern Montana Substation (E.S.R., 64, p. 257), it was found that a ration of Trebi barley and winter rye equal parts supplemented with either alfalfa hay or alfalfa hay and tankage produced more rapid but less economical gains than winter rye as the only grain for fattening swine. When Trebi barley and winter rye supplemented with alfalfa hay and tankage were fed, less rapid but more economical gains were produced than when hull barley was the only grain. Horn barley or a mixture of Horn and Trebi

barley with the above supplements gave more rapid and economical gains than winter rye. Durum wheat excelled common winter rye or a mixture of barley and winter rye as a feed for fattening swine with the above supplements.

Spring rye was slightly better than winter rye for producing rapid and economical gains when fed with alfalfa hay to fall pigs. The addition of a small amount of tankage to a rye or barley and rye and alfalfa ration decreased by about 2 weeks the time required to grow and fatten pigs from 50 to 200 lb., but did not reduce the cost of gains. In one test 1 ton of tankage replaced 4 tons of alfalfa, and this factor should be considered in purchasing supplements. Adding bone meal to a barley-rye-alfalfa ration was not practical in these tests.

The influence of radiant energy on hematopoietic processes in the pig, R. D. Sinclair (*Sci. Agr., 13 (1933), No. 12, pp. 737–742, fig. 1; Fr. abs., p. 781*).—Continuing a previous study (E.S.R., 70, p. 223), blood samples were obtained from pigs receiving various treatments during the months of December, January, February, March, and April. These samples were analyzed for red and white cell counts.

The results indicated that radiant energy did not play any part in hematopoietic processes in this study. Erythrocyte counts and packed cell volume agreed very closely in showing the blood picture. No information of special value was obtained from leucocyte counts.

The chemical character of the blood and urine of colts, W. W. Dimock and D. J. Healy (*Jour. Amer. Vet. Med. Assoc., 83 (1933), No. 6, pp. 806–809*).—In this paper from the Kentucky Experiment Station the results of analyses of the blood and urine of normal yearling fillies, of overfed fillies, and of the same fillies after two months on a restricted diet are presented in tabular form.

The relation of filtrable to non-filtrable calcium in chicken blood, J. T. Correll and J. S. Hughes (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 511–514*).—The Kansas Experiment Station made a study of the calcium partition in chicken serum, using a high pressure ultrafilter, to determine the amount of calcium in each fraction when the total serum calcium varied over wide ranges.

The average value of filtrable calcium in males was found to be 6.4±0.1 mg, of nonlaying hens 6.5±0.2 mg, and of laying hens 6.4±0.1 mg. The total calcium for laying hens was from two to three times as high as that for nonlaying hens or males. The ratio of filtrable to nonfiltrable calcium did not remain constant as the total calcium in laying hens increased.

The hemoglobin content of chicken blood, A. D. Holmes, M. G. Pigott, and P. A. Campbell (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 657–664*).—Following their usual experimental procedure (E.S.R., 68, p. 803), the authors made a study of the hemoglobin content of the blood of normal chicks raised on high quality commercial chick-growing mashes. Blood samples from the wings were taken when typical chicks were 3, 6, 9, and 12 weeks of age.

Cockerels showed a consistent increase in hemoglobin of from 9.6 g per 100 cc of blood at 3 weeks to 10.1 g at 12 weeks. During the same interval pullets increased from 9.3 to 9.7 g. Limiting the water consumption during crate feeding did not increase the hemoglobin values. Based on these results it was concluded that rapidly growing chicks fed well balanced high quality commercial rations had a hemoglobin content of about 9 to 10 g per 100 cc of blood.

Experiments in fattening with palm oil in lieu of mutton fat, C. E. Fermor (*Bul. Imp. Inst. [London], 31 (1933), No. 3, pp. 390–392*).—In experiments at the South-Eastern Agricultural College it was found that when birds of a white flesh variety were fed the same basal ration, the color of the flesh

was not affected if one group received mutton fat and the other group palm oil. It was found that there was no appreciable difference in the gains produced by the two feeds.

Feeding cane molasses to growing chicks and laying hens, A. J. G. Maw (*Sci. Agr., 13 (1933), No. 12, pp. 743–745; Fr. abs., p. 781*).—In a study at Macdonald College, Quebec, chicks in batteries were fed rations containing 1, 3, 5, and 7 percent of molasses for 10 weeks, while with Leghorn pullets molasses was used to replace part of the corn or the powdered buttermilk, or both, of the basal ration for a period of 20 weeks.

It was found that adding molasses to the mash fed to chicks increased the feed consumption without a corresponding increase in body weight. While the feed consumption and body weight of hens was not affected by adding molasses to the ration, such an addition did lower the egg production.

Calcium and phosphorus studies in the chick, C. A. Elvehjem and B. E. Kline (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 733–744, fig. 1*).—This study at the Wisconsin Experiment Station was designed to show the changes in the calcium and phosphorus content of the blood and ash of the bones of chicks during the first 6 weeks of life when fed on rachitogenic rations and on the same rations plus vitamin D.

Analyses showed that the average calcium content of 1- to 2-day-old chicks was 12 mg per 100 g of blood. When a diet containing ample amounts of vitamin D was fed the calcium increased to 13 to 14 mg during the first week, and then gradually dropped to values of 10 to 11 mg at 3 to 6 weeks of age. A decrease in the phosphorus content of the diet did not affect the calcium content of the blood. When no vitamin D was added the calcium dropped to 9 to 10 mg during the first week, followed by an increase the second week, and then by a drop to 7 to 8 mg at 4 weeks of age. The lack of vitamin D showed its effect on the calcium content of the blood during the first week.

On a standard rachitogenic diet plus cod-liver oil or irradiation, the inorganic phosphorus content of the blood decreased from about 9 mg during the first week to 6 or 7 mg at 6 weeks of age. When no vitamin D was added, the values dropped from 9 to 5 mg at 4 weeks and continued at this level until the animal died of rickets.

If the added inorganic phosphorus was omitted from the ration, the average value dropped from 7 mg at 1 week to 5 mg at 6 weeks even in the presence of vitamin D. When vitamin D was omitted, only slightly lower values were obtained.

The ash content of the bones of chicks reared on the rachitogenic ration decreased slowly from 30 to 32 percent at 1 week of age to from 27 to 29 percent at 5 weeks. When ample vitamin D was fed, the ash increased to 36 percent during the first week and to from 40 to 42 percent at 6 weeks. The ash content of the bones of chicks on a low phosphorus plus vitamin D ration was slightly lower than that of chicks on the high phosphorus diet.

A discussion of the application of these results to the interpretation of blood analyses in rachitic studies, to the use of shorter feeding periods for the assay of vitamin D, and to the study of the mechanism of vitamin D activity is included.

Comparative value of some commercial protein supplements in the rations of growing chicks, O. Johnson and D. Brazie (*Jour. Agr. Res.* [U.S.], *48 (1934), No. 2, pp. 183–186, fig. 1*).—Because of the many sources of protein concentrates available, the Washington Experiment Station undertook a study to determine the feeding value of these different concentrates and mixtures of them when used in the chick rations recommended by the college. The same

all-mash basal ration was fed to 9 lots of 20 White Leghorn chicks each. This ration was supplemented with the various concentrates and mixtures fed so that the protein level was maintained at approximately 14 percent.

Chicks fed Alaska herring meal made the best growth, those fed Argentine meat scrap the poorest, while those receiving Vico meat scrap, fish shreds, and skim milk powder, or combinations of the various concentrates, were intermediate in growth rate. The biological values were determined for each lot, but could not be associated with other data to show that better growth in some lots was due to better protein utilization. The lot making the greatest gain in weight per gram of protein ingested made the best growth, but this relationship did not hold in the other lots. The lot making the greatest gain per gram of protein also showed the greatest feed consumption.

A note on pilchard oil for chicks, V. S. Asmundson and W. J. Allardyce (*Sci. Agr., 13 (1933), No. 12, pp. 749, 750; Fr. abs., p. 782*).—In one test at the University of British Columbia crossbred chicks fed 1 percent of either British Columbia pilchard oil, California sardine oil, or commercial cod-liver oil were equally well protected against rickets up to 5 weeks of age. Chicks on the same ration without oil developed severe rickets. Pilchard oil containing 40 percent stearin gave results equal to those obtained with cleared or uncleared oil from the same source. This would indicate that 0.5 percent of this oil was enough to prevent rickets.

The antirachitic value of pilchard oil (sardine oil) for growing chicks, J. Biely and V. E. Palmer (*Sci. Agr., 14 (1933), No. 3, pp. 136–140; Fr. abs., p. 154*).—Continuing the above study, two experiments were undertaken to obtain additional data on the antirachitic potency of various samples of pilchard oil produced in British Columbia.

The chickens fed the basal ration which was deficient in vitamin D, supplemented at 0.5 and 1 percent levels with commercial pilchard oil, had practically the same ash analyses as chicks fed the same basal ration supplemented with 1 percent of medicinal cod-liver oils.

Chick brooding, feeding, and management, W. C. Tully (*South Dakota Sta. Circ. 15 (1934), pp. 20, figs. 8*).—Starting and growing rations that have been tested and found satisfactory for chicks and information on chick management are presented.

Jungle fowls from Pacific islands, S. C. Ball (*Bernice P. Bishop Mus. Bul. 108 (1933), pp. 121, pls. 7, figs. 5*).—In this bulletin the author gives some of the historical facts surrounding the fowls of the Pacific islands, describes the birds found on the various islands, and discusses the colors of the feathers as determined by their physical properties.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1933, pp. 21–23, 24, 43, 47, fig. 1*).—Data are reported on work with dairy cattle on supplementing soybean hay with and without high protein concentrates, the value of grinding grains for growing dairy calves, and biological assays of butterfat produced by cows fed ground raw soybeans and ground roasted soybeans as protein supplements in the grain ration.

In work with dairy products information was obtained on a study of the producer's method of disposing of milk and dairy products and the returns secured, refrigeration of churning cream during the marketing process, cream quality studies, enclosed body truck v. open for transporting milk, milk quality improvement program, a study of lecithin content of milk and its products, a

study of methods used in washing milking machines and their comparative value, the effect of hydrogen-ion concentration and season of the year upon the keeping qualities of butter as manufactured under commercial conditions, a study of the enzymes in sweet and sour farm-skimmed cream as related to the keeping qualities of butter, the effect of soybeans on the vitamin A value of butter, and vitamin A activity, carotene content, and antioxidants in butterfat.

[Experiments with dairy cattle and dairy products in Michigan], E. L. Anthony (*Michigan Sta. Rpt. 1933, pp. 218, 219, 220, 221*).—In dairy cattle tests, data were obtained in work on feeding concentrates alone to ruminants, the effects of feeding gossypol with a ration free from cottonseed meal, the relation of magnesium, calcium, phosphorus, and vitamin D in the ration of dairy cattle, the effect of a simple grain mixture on milk production, and a study of the rate of passage of inert materials through the digestive tract of the cow.

Information was obtained on the effect of some milk plant processes on the curd tension of milk and the effectiveness of several proposed stabilizers in ice cream.

[Experiments with dairy animals in New Mexico] (*New Mexico Sta. Rpt. 1933, pp. 47, 48, 49*).—Results obtained in studies on the improvement of milk goats and the feeding of the ground whole hegari plant with supplements to dairy cows are reported.

[Investigations with dairy cattle and dairy products in Washington] (*Washington Sta. Bul. 291 (1934), pp. 26–30*).—The results of studies with dairy cattle are given as to the efficiency of rotational grazing in western Washington and the carrying capacity of pure stands of reed canary grass, by R. E. Hodgson, M. S. Grunder, and J. C. Knott; the determination of apparent digestibility by modified procedures, and the apparent digestibility of pea straw and pea feed, both by Knott, Hodgson, and E. V. Ellington; the value of artificially dried pasture herbage for milk production, alfalfa hay alone v. alfalfa hay and artificially dried grass as a ration for dairy cows, the calcifying properties of green, artificially dried, and sun-cured pasture herbage, and the influence of pasture management upon grazing habits of dairy cattle, all by Hodgson and Knott; and the effect of temperature of drying on the apparent digestibility and availability of nitrogen, calcium, and phosphorus of pasture herbage, by Hodgson, Knott, and R. R. Graves.

In dairying, information was obtained on the value of hydrogen-ion determination of the butter serum in the scoring of the butter, by H. A. Bendixen, C. C. Prouty, and Ellington; and the bacterial content of high quality milk, by Prouty and Ellington.

The influence of phosphorus deficiency in dairy cows on the coefficient of digestibility and the balance of calcium and phosphorus, W. H. Riddell, J. S. Hughes, and J. B. Fitch (*Jour. Agr. Res. [U.S.], 48 (1934), No. 2, pp. 167–170*).—In order to obtain information on the effect of the prolonged feeding of a phosphorus-deficient ration on the efficiency of digestion, the Kansas Experiment Station carried out a series of digestion trials with three cows, two of which were in advanced stages of aphosphorosis.

It was found that these cows digested their feeds as efficiently as the normal control, and the results showed that the lowered feed utilization of such cows was not a result of inefficient digestion of the feed. The animals were in negative balance for both calcium and phosphorus.

The proper supplementary ration for milking cows on fertilized pasture, R. C. Foley (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 407–411, fig. 1*).—The Massachusetts Experiment Station conducted two trials to determine how pasturing

should be supplemented. In the first trial one lot of nine cows received concentrates at the rate of 1 lb. of grain to 4.5 lb. of milk, while a similar lot received all the mixed hay they would clean up twice daily and grain at the rate of 1 lb. to 10 lb. of milk. In the second trial three lots of six cows each were fed in the same manner, except that the third group received 3 lb. of oat feed daily in place of the mixed hay.

It was found that mixed hay was a desirable addition to fertilized pastures for milking cows. Following such procedure in feeding resulted in a wider grain-to-milk ratio and in lowered cost of production during the summer months. Oat feed was satisfactory for replacing mixed hay when the latter was scarce or high in price. In order to carry out this method of feeding an abundance of palatable nutritious pasture was essential.

Dietary acidosis in dairy cattle, A. E. PERKINS and C. F. MONROE (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 413–426*).—Continuing the study of acidosis (E.S.R., 64, p. 767), the Ohio Experiment Station reports the results of studies carried out as two distinct units. In the summer phase, lactic, acetic, and three mineral acids were fed to cows on a parture-grain and dried beet pulp ration. The winter phase on different cows involved the use of various single feeds and combinations of these feeds.

The feeding of from 1.5 to 1.75 lb. daily of either lactic or acetic acid in addition to an otherwise normal ration failed to produce the characteristic symptoms of acidosis in the urine of cattle. The level of acid feeding was greater than a cow would be likely to ingest in silage. Feeding hydrochloric, sulfuric, or phosphoric acids at a level of only 2 or 3 oz. per head daily brought about rapid development of pronounced symptoms of acidosis and a marked increase in the corresponding acid radical in the urine.

Silage fed alone or in combination with other feeds did not produce characteristic acidosis symptoms, and when fed with a ration that normally produced acidosis prevented or delayed the appearance of this condition. Adding corn silage after pronounced acidosis had been produced by another ration gradually reduced the urinary analysis to a condition approaching normal. All of the leguminous hays tested had a decidedly alkaline effect, and timothy hay was similar to silage in its effect on the urine. Exclusive grain feeding soon developed marked signs of acidosis, as indicated by the almost complete disappearance of bicarbonates and an increase in ammonia to 20 or more times the normal level in the urine. When fed in connection with any roughage, grain seemed to depress the bicarbonates and to increase the ammonia. The protein content of the grain did not appear to have any particular influence in this respect. Feeding alkaline mineral supplements seemed relatively unsatisfactory in correcting the results of an acidic ration.

The effects of some fly sprays on the hides and on the body temperatures of dairy cows, J. L. WILSON, A. M. PEARSON, and C. Y. CANNON (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 427–433, fig. 1*).—The Iowa Experiment Station made a study of the physiological effect of 12 petroleum oils varying in viscosity and degree of refinement and containing various added chemical fly repellents. The oils were sprayed on the animals at the rate of 2 fluid oz. per head daily.

It was found that seven of the oils caused no skin injury over a 2-month period, while five oils caused a loss of hair and cracking or peeling of the skin. The injury was most apparent on those portions of the body most exposed to the rays of the sun. The amount of injury was influenced by the method of application and by the susceptibility of individual animals to skin injury. When the maximum daily air temperatures averaged 86° F. the body tempera-

ture of sprayed animals was slightly higher than that of unsprayed animals. With five of the oils the temperatures of the cows were not greatly affected, but six oils caused marked though not dangerous rises in temperature. The rise in body temperature was more pronounced as the surrounding air temperature increased.

The temperature of milk immediately after milking and strainer capacity, A. C. DAHLBERG and H. L. DURHAM (*New York State Sta. Bul. 639 (1934), pp. 11, figs. 4*).—Experiments on the temperature of milk immediately following milking were planned to obtain information on factors affecting the temperature of milk.

Hand-drawn milk was warmer and more uniform in temperature than machine-drawn milk. In a barn at 50° F. hand-drawn milk was 94.5°, one machine-drawn sample was 90.5°, and another machine-drawn sample was 81°. As the barn temperature became colder the temperature of the milk in the pail immediately after milking decreased. This decrease amounted to only 3.2° for hand-milking when the temperature dropped from 80° to 50°, but for one machine sample the change was 5.8° and for the other 9.9°. Milk from heavy-producing cows was warmer than that from low producers. When hand-drawn this difference varied from 92° to 96.8° as the yield varied from 5 to 20 lb. per milking. For the machine giving the coldest milk at a barn temperature of from 50° to 60° the temperature of the milk varied from 78.5° to 88.7° as the yield increased from 5 to 25 lb. per milking. The time required to milk did not affect the temperature of the milk when normal rates of milking were used.

A 7.5-in. cotton strainer pad strained one 10-gal. can of milk at 80° and three 10-gal. cans at 90°. From this it was evident that variations in the temperature of milk in the pail were of great importance in affecting strainer capacity and readily explained some difficulties met in straining milk during cold weather.

The phospholipids in milk, I–III (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 445–466, fig. 1*).—This series of studies was carried out by the U.S.D.A. Bureau of Dairy Industry.

I. *Their distribution among some milk products*, G. E. Holm, P. A. Wright, and E. F. Deysher (pp. 445–454).—This phase was conducted to determine accurately the amount of phospholipids in various milk products, which in turn might show to what extent they introduce errors into the various tests used for fat content. A micronephelometric method was used for determining the phospholipids of whole milks, their respective skim milks and creams, and the butters and buttermilks from the churned creams. The percentage distribution among its various products of the phospholipids present in whole milk was calculated from the amount of product obtained and its determined phospholipid content. The results are presented in tabular form.

II. *The phospholipids in skim milks and their effect upon the accuracy of the various fat tests*, P. A. Wright and G. E. Holm (pp. 455–459).—This phase of the study was concerned with the extent to which the phospholipids of skim milk accompany the fat in tests and the magnitude of the error thus introduced.

Skim milk was found to contain approximately 0.13 percent phopholipids. The Babcock, Modified Babcock, and Minnesota Babcock methods removed only negligible amounts of these compounds, but the extraction method (Roese-Gottlieb) removed 15 percent of the fat in skim milk containing approximately 0.1 percent fat, which was equivalent to approximately 12 percent of the total amount of phospholipids present in the milk. The amount of these compounds extracted from various milks by the latter method was practically constant.

so the percentage of error in making fat determinations by this method became smaller with increases in the fat content of the sample and vice versa.

III. *The phospholipids in buttermilk and their effect upon the accuracy of various fat tests*, P. A. Wright, E. F. Deysher, and G. E. Holm (pp. 460–466).—In this phase the phospholipid content of buttermilk and the effect of various methods of testing upon it were studied.

In eight sweet cream commercial buttermilks the phospholipids content was approximately 0.27 percent. None of the tests used recovered appreciable amounts of phospholipids in the fat, except the extraction method for which corrections for the presence of these compounds amounting to from 6 to 17 percent must be made according to the fat content of the sample. More fat was recovered from liquid and reconstituted dried buttermilks by the Modified Babcock method than was recovered by any of the other methods tried.

Factors governing the manufacture of sweet-curd cottage cheese, L. M. Thurston and I. Gould, Jr. (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 467–480, figs. 2*).—In this study at the West Virginia Experiment Station data are reported on 146 batches of cheese. Each batch was made in a 50-gal. cheese vat so as to approximate commercial conditions as nearly as practical, about 300 lb. per batch being used.

The results showed that when rennet extract was used as a coagulant in making cottage cheese, the acidity of the whey at cutting must be 0.41 percent or higher to prevent excessive matting and the production of a hard rubbery curd on cooking. A setting temperature of 90° F. was preferable to 70°, as at the higher temperature the time required for coagulating was reduced and fermentations causing off flavors were not so apt to develop. Skim milk should be pasteurized at 145° for 30 min. rather than at higher temperatures when a holding period is used, because the resulting curd firms more readily and is less apt to shatter and break following such treatment.

The important function of rennet was to prevent matting after cutting rather than to produce coagulation. Excessive amounts of the extract produced excessive shattering of the curd on stirring and delayed the firming process. The temperature to which the curd must be heated in the whey to produce uniform firmness was governed by coagulating conditions and the acidity of the whey at the time of cutting. In this study the use of calcium chloride in setting milk had no apparent effect on coagulation and curd production. The quantity of culture used for setting should be from 5 to 10 percent of the quantity of skim milk to be coagulated.

Using plastic cream as an ingredient in the manufacture of ice cream, C. R. Foskett and M. J. Mack (*Ice Cream Trade Jour., 29 (1933), No. 9, pp. 20–23, figs. 3*).—The Massachusetts Experiment Station carried out a study to obtain information on the value of plastic cream as a constituent of ice cream. Plastic cream is cream with a fat content of approximately 80 percent, in which the fat remains in its original emulsion with the milk solids-not-fat present in the serum, and which is not in the fluid state at ordinary temperatures.

It was found that ice cream mixes in which plastic cream was the source of fat showed more clumping of fat globules, had a higher viscosity, whipped more slowly, and had a poorer flavor than mixes made from frozen or sweet cream. There was less clumping of fat globules, a lower viscosity, and better whipping properties in plastic cream mixes than in mixes made with butter. Ice cream made from plastic cream was superior in flavor and melting characteristics to that made from butter. Plastic cream was best suited for use as a source of fat in mixes of relatively low fat content. The age and source of plastic cream for ice cream was not of great importance, that which was put into storage during the summer months having a slightly higher whipping ability.

Adding dried egg yolk, lecithin, and sodium citrate to plastic cream mixes improved their whipping properties, but the yolk was recommended as being the most satisfactory from a practical standpoint. Double-stage homogenization of plastic cream mixes appeared to be best adapted for mixes of high fat content or mixes made and frozen under adverse conditions. It was recommended that sweet cream be used in combination with plastic cream because such a mixture was less viscous, there was less fat globule clumping, more rapid whipping, and an improved flavor.

How freezing and hardening affect the texture of the ice cream, H. H. BRADLEY and C. D. DAHLE (*Ice Cream Trade Jour., 29 (1933), No. 11, pp. 27–30, figs. 5*).—The Pennsylvania Experiment Station planned this work to study the advantages of quick freezing and hardening of ice cream, of drawing temperatures, and of whipping time. Photomicrographs were made of the ice cream after hardening.

The results indicated that different amounts of ice may be present in ice creams drawn at the same temperature. The rate of hardening affected the size of ice crystals—rapid hardening promoting smaller crystals—and the texture of the resulting ice cream. At the same drawing temperature ice cream from a continuous freezer was smoother than that from a batch freezer. The texture score of batch-frozen ice cream was affected by the butterfat content from 10 to 18 percent, but this was not true of ice cream from the continuous freezer. Increasing the butterfat content delayed the rate of hardening. A circulation of air in the hardening room, low drawing temperatures, and low overrun reduced hardening time.

Factors that affect requirements of power in viscolizing the mix, C. D. DAHLE and J. E. NICHOLS (*Ice Cream Trade Jour., 29 (1933), No. 11, pp. 37, 38*).—In this study at the Pennsylvania Experiment Station tests were made on the power consumption of a viscolizer, and observations were noted on changes in power consumption during operation under various conditions.

More power was consumed at the beginning of the test than at the conclusion. This difference was due to the greater mechanical friction encountered at the beginning of the run. In order to obtain comparable data the machine was run for 15 to 20 min. before collecting data. Under these conditions it was found that the greater the pressure used, the greater was the consumption of power. The temperature of the mix had little effect on the consumption of power.

The effect of pasteurizing on the bacterial flora of the ice cream mix, C. M. DUBOIS and W. H. MARTIN (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 435–443*).—The Kansas Experiment Station subjected standard ice cream mixes made from raw products and from ingredients that had been previously pasteurized to various pasteurizing temperatures and holding periods. Total and differential bacterial counts were made before and after pasteurizing to determine which types were destroyed, and the characteristics of the surviving organisms were studied. Some of the tests were carried out in test tubes, while other work was done under plant conditions.

None of the pasteurizing temperatures used yielded results sufficiently different to be measured by the plate method. Practically the same results were obtained with the plant tests as with the test tube experiments. The flora in mixes made from raw products were about evenly divided between the peptonizing and alkali-forming and inert groups, while in mixes made from previously pasteurized ingredients the flora were slow acid formers. When isolated the latter organisms were found to be small Gram-positive rods which

grew well at 80° F., but not at 98°. Since they produced acid slowly, their significance in souring ice cream mixes was doubtful.

Studies on melting ice cream, W. S. Mueller (*Ice Cream Trade Jour., 29 (1933), No. 10, pp. 18, 19, figs. 5*).—Studies at the Massachusetts Experiment Station indicated that unintentional high initial aging temperatures were probably an important factor in causing the excessive retardation of melting and the curdled appearance on melting of ice cream, which has been an unexplained source of trouble with ice cream manufacturers.

Eliminating stale, metallic flavor from strawberry ice cream, P. H. Tracy, R. J. Ramsey, and H. A. Ruehe (*Ice Cream Trade Jour., 29 (1933), No. 12, p. 40*).—Tests at the Illinois Experiment Station indicated that the stale, metallic, or tallowy flavor of strawberry ice cream was due to an oxidation of the butterfat. This reaction was hastened by the presence of copper salts and by a certain minimum amount of strawberries. The defect could be controlled best by reducing the copper contamination to a minimum, by using dairy products of the highest quality, by the use of 15 percent or more of solid-pack berries, and by homogenizing the mix at a high pressure.

VETERINARY MEDICINE

[Report of work with livestock diseases in Indiana] (*Indiana Sta. Rpt. 1933, pp. 49, 50–53, figs. 2*).—The work of the year referred to (E.S.R., 69, p. 104) includes that with the formation of urinary calculi in sheep, immunization for infectious abortion, nonspecific abortion, anemia in pigs, the relation of the ration to death rate in pigs farrowed by gilts, histopathology of spleens from cholera pigs, testing of commercial hog cholera serum and virus, diagnosis of animal diseases, encephalitis in young hogs, and equine infectious anemia.

[Report of work with diseases of livestock at the Michigan Station], E. T. Hallman, W. Giltner, et al. (*Michigan Sta. Rpt. 1933. pp. 177–186, 188–200, 202–208, figs. 2*).—Work of the year referred to (E.S.R., 71, p. 96) includes that with infectious abortion control by B. J. Killham and (1) immunization of cattle against Bang's disease with nonvirulent living culture of *Brucella abortus*, (2) an immune serum for treatment of brucelliasis of man, (3) the therapeutic value of fractions of the cell on *Brucella* infection of man and animals, (4) maintenance and study of culture collection of *Brucella*, (5) chemistry of *Brucella*, (6) studies of *Brucella* infection in swine, and (7) diagnostic studies, all by I. F. Huddleson; survey of parasitic fauna and coccidiosis control, by W. L. Chandler; and blackhead in turkeys, lead poisoning in ducks, and roup, all by H. J. Stafseth.

Report on the Veterinary Department, Burma, for the year ending the 31st March 1933, D. T. Mitchell (*Burma Vet. Dept. Rpt., 1932–33, pp. [5]+27, pls. 5*).—The occurrence of and work of the year with infectious diseases are reported upon, the details being presented in tabular and map form (E.S.R., 69, p. 709).

The toxicity to grazing animals of grass sprayed with a solution of sodium arsenite, A. D. Husband and J. F. Duguid (*Rhodesia Agr. Jour., 31 (1934), No. 1, pp. 25–39, pl. 1*).—The grazing of cattle on grass to which sodium arsenite had been applied at the rate of 1.5 lb. per acre, as in combating grasshopper invasion, resulted in their death in 96 hr. from arsenical poisoning.

"Water bloom" as a cause of poisoning in domestic animals, C. P. Fitch, L. M. Bishop, W. L. Boyd, R. A. Gortner, C. F. Rogers, and J. E. Tilden (*Cornell Vet., 24 (1934), No. 1, pp. 30–39, fig. 1*).—This contribution from the Minnesota Experiment Station reviews the literature relating to the poisoning

of animals by algae, referred to as "water bloom", in connection with a list of 12 references, and describes five outbreaks that have occurred since 1918. Death occurs shortly after the animals ingest large quantities of water containing the algae. Sheep, pigs, and farm poultry succumbed to the poisoning. The tests and reactions indicate that the toxin is an organic compound, although not as yet isolated.

Transmission of animal diseases by aeroplanes, P. J. du Toit (*League Nations Health Organ. Quart. Bul., 2 (1933), No. 1, pp. 113–115; also in Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 3, pp. 291–293*).—The author calls attention to the fact that infectious diseases may be conveyed through the instrument of airplanes in three ways, (1) conveyance of live animals, (2) transportation of insect vectors, and (3) by products containing infective material. The importance of national regulations and international agreements for the prevention of the transmission of animal diseases by airplanes is emphasized.

Pathogenic microörganisms, W. H. Park and A. W. Williams (*Philadelphia, Pa.; Lea & Febiger, 1933, 10. ed., rev. and enl., pp. IX+17–867, pls. 11, figs. 215*).—This is a tenth enlarged and thoroughly revised edition of the work previously noted (E.S.R., 62, p. 259).

[**Contributions on animal parasites**] (*Jour. Parasitol., 20 (1933), No. 2, pp. 97–102, 107–112, 112–114, fig. 1*).—Abstracts of contributions presented at the meetings of the Helminthological Society of Washington held in April and May 1933 include the following: The Development of the Swine Stomach Worm *Hyostrongylus rubidus* in Guinea Pigs, by J. E. Alicata (p. 97); *Spirochaeta lagopodis* in the Blood of a Willow Grouse [*Lagopus lagopus*], by E. A. Allen (p. 97); Observations on the Life History of *Tetrameres pattersoni* (pp. 97, 98) and Observations on the Life History of *Seurocynrea colini* (p. 98), both by E. B. Cram; The White-Footed Mouse *Peromyscus leucopus noveboracensis* a New Host for *Entosiphonus thompsoni* Sinitsin 1931 (Brachylaemidae) (p. 98), New Hosts for *Haematoloechus complexus* (Seely 1906) Krull n.comb. (p. 98), The Opossum *Didelphis virginiana virginiana* Kerr, a New Host for *Brachylaemus spinosulum* (Hofmann 1899) (pp. 98, 99), and Infections of the White-Footed Mouse *Peromyscus leucopus noveboracensis* with *Fasciola hepatica* Linn. (p. 99), all by W. H. Krull; Probabilities of Fortuitous Coincidence in the Experiments Previously Reported [E.S.R., 69, pp. 278, 279] on the Control of Poultry Coccidiosis by the Chemical Treatment of Litter (pp. 99, 100) and Chemical Treatment of Litter as an Aid in the Control of Rabbit Coccidiosis (pp. 100–102), both by J. Andrews; *Antilocapra americana*, an Additional Host of *Nematodirella longispiculata*, by G. Dikmans (p. 107); A Note on the Life History of *Ostertagia circumcincta* (p. 107) and A Note on the Time of Survival of Larvae of *Haemonchus contortus*, *Ostertagia circumcincta*, and *Nematodirus spathiger* on Pastures (p. 107), both by G. Dikmans and J. S. Andrews; New Snail Hosts [*Fossaria modicella rustica* (Lea) and *Pseudosuccinea columella* (Say)] for *Fasciola magna* (Bassi 1875) Stiles 1894 (pp. 107, 108), The Snails *Pseudosuccinea columella* and *Galba bulimoides techella*, New Hosts for *Paramphistomum cervi* (Schrank 1790) Fischder 1901 (p. 108), Notes on *Clinostomum* (p. 108), Notes on *Allassostoma parvum* Stunkard (p. 109), A Note on the Toxic Effect of Copper for Snails (p. 109), and Studies on the Life History of *Brachylaemus* sp., possibly *B. spinosulum* (Hofmann 1899) (pp. 109, 110), all by W. H. Krull; Equine Parasites from Puerto Rico, by A. McIntosh (p. 110); What is *Ascocotyle plana* Linton? (pp. 110, 111), New Host Records for Trematodes of the Genus *Phagicola* (p. 111), and A Note on the Genus *Schistosoma* Weinland (pp. 111,

112), all by E. W. Price; The Occurrence of *Dirofilaria immitis* and the Incidence of Intestinal Helminths in Virginia Dogs (p. 112) and A Critical Experiment with Santonin in Small Single Doses for Intestinal Helminths of Dogs (pp. 112, 113), both by P. C. Underwood; Observations on the Periodicity of *Dirofilaria immitis* Larvae in the Peripheral Blood of Dogs, by P. C. Underwood and W. H. Wright (p. 113); *Echinuria spinosa* Maplestone 1931, a Male of the Genus *Tetrameres*, by E. E. Wehr (pp. 113, 114); and The Anthelmintic Efficacy of Primary Monobrom Hydrocarbons for *Ancylostoma cannium*, by W. H. Wright and J. M. Schaffer (p. 114).

[Contributions on animal parasites and control measures] (*Jour. Parasitol, 20 (1933), No. 2, pp. 123–125, 126–130, 130–132, 133, 138, 139, 141, 142, 143, 145, 146*).—Among the contributions on animal parasites presented at the annual meeting of the American Society of Parasitologists (E.S.R., 69, p. 267), held in Boston, Mass., in December 1933, abstracts of which are presented, are the following: Rediscovery of *Eimeria carinii* Pinto 1923, by E. R. Becker and R. D. Burroughs (p. 123); Artificial Extension of the Intervals between Oöcyst-Peaks in the Sparrow Coccidium, by D. C. Boughton, F. O. Atchley, and L. C. Eskridge (p. 123); Some Physiological Effects of Coccidia on Chickens, by C. A. Herrick (pp. 123, 124); Effect of Oily Mixtures of Phenolics on the Oöcysts of Poultry Coccidia, with Special Reference to *Eimeria tenella*, by J. Andrews (p. 124); An Attempt to Transmit *Trichomonas vaginalis* to the Intestinal Tract of Kittens, by J. F. Kessel (p. 124); The Duration of Malarial Infection in Birds (pp. 124, 125) and The Effect of Rauwolfine on the Avian Malarias (p. 125), both by R. D. Manwell; Bovine Coccidia Carriers, by L. V. Skidmore (p. 126); When Are *Ascaris* Eggs Infective? by N. R. Stoll (p. 126); Resistance of the Cat to *Ascaris* Infection, by M. P. Sarles (pp. 126, 127); On the Comparative Resistance of Six Breeds of Chickens to the Nematode *Ascaridia lineata* (Schneider), by J. E. Ackert, L. L. Eisenbrandt, B. Glading, and J. H. Wilmoth (p. 127); Sex Differentiation in Preparasitic Larvae of *Hyostrongylus rubidus* and Development of Male and Female Reproductive Systems, by J. E. Alicata (pp. 127, 128); Observations on *Trichostrongylus tenuis* Infestation in Domestic and Game Birds in the United States, by E. B. Cram and E. Cuvillier (p. 128); Reaction of Laboratory Rats to Graded Numbers of *Nippostrongylus* Larvae, by G. L. Graham (p. 128); A Preliminary Report on the in vitro Consumption of Oxygen by Parasitic Nematodes, by P. D. Harwood and H. W. Brown (pp. 128, 129); Oxidation-Reduction Potential as a Factor in the Growth of Intestinal Parasites in vitro, by T. L. Jahn (p. 129); On the Comparative Resistance of Bronze Turkeys and White Leghorn Chickens to the Nematode *Ascaridia lineata* (Schneider), by J. E. Ackert and L. L. Eisenbrandt (p. 129); Control of Swine Kidney Worm [*Stephanurus dentatus*], by B. Schwartz, H. B. Raffensperger, and L. A. Spindler (pp. 129, 130); The Characters of a Protonematode, by B. G. and M. B. Chitwood (p. 130); A Revised Classification of the Nematoda, by B. G. Chitwood (p. 131); Notes on the Economic Importance, Life History, and Control of *Moniezia expansa* Rudolphi, the Common Tapeworm of Sheep, by S. B. Freeborn (p. 131); The Molluscan Phase of the Life Cycle of *Schistosoma mansoni*, by E. C. Faust and W. A. Hoffman (pp. 131, 132); Observations on the Intestinal Protozoa of Young Pigs and Attempts to Produce Infection with a Human Strain of *E[ndamoeba] histolytica*, by W. W. Frye and H. E. Meleney (p. 133); Warble [*Oedemagena tarandi* L.] Injuries to Reindeer Hides (p. 138) and Migration of Warbles [*Oedemagena tarandi* L.] in Reindeer (p. 138), both by W. E. Dove and E. C. Cushing; Further Studies on the Biology of the Pigeon Fly (*Pseudolynchia maura*) (Diptera, Hippoboscidae), by M. J. Prouty and G. R. Coatney (p. 139); Polyandry and Polyg-

amy in Parasitic Worms, by A. McIntosh (p. 141); The Comparative Toxicity of Certain Anthelmintics, by H. W. Brown and P. D. Lamson (pp. 141, 142); Blood Studies of Experimental Infections with the Dog Hookworm, *A[ncylostoma] caninum*, by A. O. Foster (p. 142); Artificial Immunization of Rats against Trichiniasis, by O. R. McCoy (pp. 142, 143); The Effect of Atabrine and Plasmochin on the *Haemoproteus [columbae]* Infection of the Pigeon, by G. R. Coatney (p. 145); The Epidemiology of Hookworm Disease in Palestine, by J. A. Scott (p. 146); and Anomalous and Non-specific Reactions with *Trichinella spiralis* Antigen in Relation to Other Disease Conditions, by G. W. Bachman, R. Rodríguez-Molina, and J. Oliver-González (p. 146).

Sodium chloride vs. cane sugar for parasite egg flotation, I. D. Wilson (*Cornell Vet., 24 (1934), No. 1, pp. 79, 80*).—Contributing from the Virginia Experiment Station, the author points out that the viscosity of the sodium chloride solution at 21° C. as measured by the Saybolt Furol viscosimeter is 32.8 sec., while that of the cane sugar solution is 130.9 sec. This is quite a factor in favor of the former, but where a power centrifuge is available the difference can be overcome without difficulty.

Filtrable virus carriers, C. S. Gibbs (*Jour. Infect. Diseases, 53 (1933), No. 2, pp. 169–174*).—This contribution from the Massachusetts Experiment Station deals with filtrable virus carriers of hog cholera, rinderpest, and infectious largyngotracheitis of poultry.

Klebsiella paralytica, a new pathogenic bacterium from "moose disease", G. I. Wallace, A. R. Cahn, and L. J. Thomas (*Jour. Infect. Diseases, 53 (1933), No. 3, pp. 386–414, fig. 1*).—A report of further studies of the etiology of the disease observed in northern Minnesota and Canada (E.S.R., 69, p. 110).

Winter ticks taken from diseased moose and placed on animals in the laboratory produced symptoms similar to those of moose disease. The bacterium previously described by the authors as *K. paralytica* was isolated from winter ticks taken from diseased moose. This organism, when injected into animals, produced symptoms similar to those in the tick-infested animals and in the diseased moose. "In practically every case the injection of *K. paralytica* has proved fatal. It has been demonstrated that *K. paralytica* produces a highly potent toxic substance. This substance, when injected into animals, produces results identical with those obtained by culture inoculations. It is believed that this toxic substance is neither a true exotoxin nor an endotoxin, but rather a substance similar to the X substance described by [H.] Zinsser, [J. T.] Parker, and [A.] Kuttner.[1] While we have not proved that *K. paralytica* is the cause of moose disease, we have presented a series of observations which strongly indicate that it may be the cause. The relationship of moose disease and the disease produced experimentally and discussed in this paper to 'tick paralysis' is suggested."

Anaplasma marginale in Russia (U.S.S.R.) [trans. title], W. L. Yakimoff (*Bul. Soc. Path. Expt., 26 (1933), No. 10, pp. 1260, 1261*).—The author records the identification of *A. marginale* from Kasakstan, this being the first record of its occurrence in Russia.

Elaphostrongylus odocoilei n.sp., a new lungworm in black tail deer (Odocoileus columbianus): Description and life history, A. and M. Hobmaier (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 509–514, figs. 5*).—The authors describe a new lugworm which was found to parasitize 25 of about 100 black-tailed deer of the California Coast Range examined by them.

Helminth parasites observed in a herd of goats maintained at St. Albans, England, J. N. Oldham and D. O. Morgan (*Jour. Helminthol., 12*

[1] Soc. Expt. Biol. and Med. Proc., 18 (1920), No. 2, pp. 49–56.

(1934), No. 1, pp. 39–46).—It was found on examination of a herd of 80 goats that 14 were entirely free from helminth infestation. The total number of species of parasites found in the 66 remaining infested animals was 19, including 2 cestodes and 17 nematodes. The ages of these animals at death varied from 7 weeks to 7 years.

On a few nematodes parasitic in goats at Muktesar, G. D. Bhalerao *(Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 2, pp. 163–165, pl. 1)*.—The author presents a description and notes on *Setaria bussi* n.sp., obtained from the peritoneal cavity of a hill goat (*Capra sibirica*), and notes on *Oesophagostomum asperum* Raill. and *Gongylonema verrucosum* (Giles).

On two unrecorded nematodes from the abomasum of cattle in India, G. D. Bhalerao *(Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 2, pp. 166–173, figs. 11)*.—*Capillaria bilobata* n.sp. and *Haemonchus similis* Trav., collected on several occasions from the abomasum of cattle at Muktesar, are considered.

On Syngamus nasicola Linstow, 1899, from sheep and cattle in the West Indies, J. J. C. Buckley *(Jour. Helminthol., 12 (1934), No. 1, pp. 47–62, figs. 13)*.—The author records the occurrence of *S. nasicola* in sheep, cattle, and goats in the West Indies. The species is compared with *S. laryngeus* Raill. 1899, with which it has affinities and has hitherto been thought to be identical. *S. kingi* is compared with *S. nasicola*, and it is concluded that the two are identical, *S. kingi* becoming a synonym of *S. nasicola*. A list is given of 15 references to the literature.

Studies of the phylogeny of the trematodes [trans. title],—**VI, The life histories of some American liver flukes,** D. F. Sinitsin *(Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 6 (1933), No. 2, pp. 170–191, figs. 23)*.—This contribution deals with three American liver flukes, namely, *Fasciola californica* n.sp., from middle and northern California and Oregon, of which *Galba bulimoides* is the normal snail host; *F. halli* n.sp., which parasitizes cattle and sheep in Texas and Louisiana, of which *G. bulimoides techella* is the normal snail host; and *Fascioloides magna*, an exclusive parasite of cattle commonly known as the large American liver fluke, from middle and southern Texas. An earlier account of the large American fluke has been noted (E.S.R., 64, p. 251). A list is given of 16 references to the literature cited.

An outline of immunity, W. W. C. Topley *(London: Edward Arnold & Co., 1933, pp. VII+415, figs. 37)*.—The outline here presented is based in large part upon the data presented in The Principles of Bacteriology and Immunity written by the author in collaboration with Wilson, previously noted (E.S.R., 67, p. 738). The subject is presented in 21 chapters.

Some factors responsible for the so-called self-disinfecting power of the skin, C. S. Bryan and W. L. Mallmann *(Jour. Lab. and Clin. Med., 18 (1933), No. 12, pp. 1249–1255; abs. in Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 201, 202)*.—The authors have found that living skin has an inherent ability to destroy bacteria when implanted upon the surface, that desiccation plays an important role in the self-disinfection of the skin, that both a local and systemic residual germicidal action is imparted to the skin by irradiation with ultraviolet light, and that exposure to sunlight causes an increased killing action similar to that obtained by ultraviolet light irradiation.

Preservation of milk samples with brilliant green for streptococcus and abortus examination, C. S. Bryan *(Amer. Jour. Pub. Health, 23 (1933), No. 11, pp. 1182–1185; abs. in Michigan Sta. Quart. Bul., 16 (1934), No. 3, p. 204)*.—In the search for an agent that will preserve milk while in transit to the labora-

tory, brilliant green in a final dilution of 1:10,000 in the milk was found to give the best results. All of the laboratory tests for detection of mastitis and abortion infection could be made on milk preserved in this way. Gentian violet in a similar dilution was also found to be a good preservative agent except when the sample is to be titrated for chloride content. Samples of milk preserved in this way have been held at room temperature for 20 days with no alteration in the diagnosis from the examination.

Isolation of bacteria of the Brucella group from apparently healthy swine, W. H. Feldman and C. Olson, Jr. (*Jour. Infect. Diseases, 54 (1934), No. 1, pp. 45–50*).—The authors' studies here reported indicate that bacteria of the Brucella group may exist in the tissues of apparently normal swine without giving rise to discernible symptoms of disease.

Brucella abortus infection in guinea-pigs: Prevention and treatment with immune serum, R. Gwatkin (*Jour. Infect. Diseases, 53 (1933), No. 2, pp. 230–236*).—In continuation of the studies previously noted (E.S.R., 67, p. 166), the author has found that "repeated injections of the serum of immunized guinea pigs and rabbits protected normal guinea pigs against exposure to infection with *B. abortus* by mouth and eye. The protective value of different batches of serum was variable. No specific protective action was demonstrated in once reactive serum that had ceased to react. The serums employed failed to modify the termination of an established infection in guinea pigs. The method of injection did not materially influence the production of agglutinins and complement-fixing antibodies in guinea pigs."

Undulant fever: Its relation to brucelliasis in domestic animals, L. E. Starr (*Jour. Amer. Med. Assoc., 102 (1934), No. 12, pp. 902–907, fig. 1*).—This contribution is based in large part upon the research work by the author at the Virginia Experiment Station, previously noted (E.S.R., 69, pp. 869, 870).

The growth phases of pleuropneumonia and agalactia on liquid and solid media, J. C. G. Ledingham (*Jour. Path. and Bact., 37 (1933), No. 3, pp. 393–410, pls. 4*).—This contribution deals mainly with pleuropneumonia, the morphology and growth phases of which, together with those of agalactia, have been studied in liquid and solid media. It is concluded that these organisms may be placed provisionally in the family Actinomycetaceae.

On the fractional precipitation of the antibody containing protein of anti-rinderpest serum.—Part I, Preliminary communication, J. R. Haddow, K. C. Sen, and A. C. Roy (*Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 2, pp. 149–159*).—The results of the studies reported in this preliminary contribution are presented in connection with a list of 38 references to the literature.

The duration of immunity in calves inoculated by the bull virus cum serum method against rinderpest, J. D'Costa and Balwant Singh (*Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 2, pp. 131–148*).—The details of studies conducted are presented in tabular form.

A preliminary report on the successful infection with nasal schistosomiasis in experimental calves, M. Anant Narayan Rao (*Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 2, pp. 160–162*).—This is a preliminary account of experiments conducted with a view to determining the kind of cercariae involved, the intermediate host, and the period of incubation.

Hemolytic properties of the mastitis streptococcus, P. A. Hansen, G. J. Hucker, and M. A. Snyder (*Amer. Jour. Pub. Health, 23 (1933), No. 12, pp. 1262–1270*).—Contributing from the New York State Experiment Station, the authors report that of 91 authentic strains of *Streptococcus mastitidis* being carried in various laboratories as typical streptococci associated with mastitis,

50 were of the alpha and 41 of the alpha prime hemolytic types. "The streptococcus commonly associated with chronic or subclinical mastitis always produces the alpha or alpha prime type of hemolysis on blood agar bordering on a slight beta hemolysis. Strong beta hemolytic strains were not found among the cultures. Two strains of streptococci from mastitis were beta hemolytic, but they were found by cultural studies to be different from the type generally found associated with mastitis. A careful study of the authentic mastitis streptococci isolated from chronic cases reported to be beta hemolytic were found to be of the alpha prime type. This distinction is apparent when deep colonies are examined by a stereoscopic binocular microscope. Blood from sheep, ox, and horse were used with similar results. The type of blood did not appear to affect the type of hemolysis produced on blood plates."

Two avian tubercle bacillus dissociants and two human tubercle bacillus strains of different virulence: A chemical and biologic study, F. B. Seibert, E. R. Long, and N. Morley (*Jour. Infect. Diseases, 53 (1933), No. 2, pp. 175–184, figs. 4*).—In the investigations conducted "a typical avian tubercle bacillus (Van Es 1921) grew in rough, dry colonies on Long's synthetic medium and in smooth, greasy colonies on Petroff's egg medium. The S bacilli were longer, more slender, more beaded, and less acidfast than the R bacilli, and tended to stratify, whereas the R bacilli piled up in irregular loose clumps.

"In the few experiments carried out, the S bacilli proved more virulent for hens than the R bacilli. Differences were conspicuous in the spleen. Soon after inoculation with S bacilli numerous minute tubercles formed, which were noncaseous and loaded with bacilli. In hens infected with R bacilli at the same time, tubercles were fewer, larger, and caseous, with few visible bacilli. At a later period the lesions were more nearly alike, but more numerous in the hen infected with S bacilli.

"Chemically the S form of avian bacillus differed from the R form in several respects. The S bacilli contained less water and more fatty material than the R bacilli, and the fatty extracts of the S bacilli possessed higher iodine numbers.

"Comparable chemical fractionations were made of two strains of tubercle bacilli of human type and of different virulence, H 37 and R 1, grown on both Long's synthetic medium and Petroff's egg medium. The appearance of the colonies did not differ on the two mediums, but characteristic chemical differences existed as in the case of the two visibly different forms of avian bacilli."

B. abortus in the bovine udder and its effect on the chemical composition of the milk, C. P. Fitch and L. M. Bishop (*Cornell Vet., 24 (1934), No. 1, pp. 25–29*).—In this contribution from the Minnesota Experiment Station the authors present the results of studies of 12 animals giving a positive agglutination reaction, in all of which *Brucella abortus* had not produced udder lesions extensive enough to allow components of the blood plasma to filter through into the milk. "The chloride-lactose ratio was not increased over the quarters having no infection, and the catalase content was within normal limits. For the most part the reaction of the milk was not changed sufficiently to give a positive bromothymol blue reaction. The specific conductivity was not increased over the values found for normal quarters."

A table is given showing the results of chemical analysis of milk from individual quarters of the udder and the presence or absence of *B. abortus* in 64 quarters.

The chemotherapy of contagious bovine abortion: A résumé, Lakshmi Sahai (*Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 3, pp. 271–272*).—

This résumé is presented in connection with a list of nine references to the literature.

Bact. abortus antigen placed in the conjunctival sac as a test for Bang's disease, C. P. Fitch and C. R. Donham (*Cornell Vet., 24 (1934), No. 1, pp. 56–59, fig. 1*).—The authors conclude from studies conducted at the Minnesota Experiment Station that the ophthalmic test for bovine infectious abortion here described, in which a small quantity of a heavy suspension of heated *Bacterium abortus* organisms, diluted 50 percent with sterile glycerin, is dropped into the conjunctival sac of suspected animals, does not appear to be sufficiently reliable to justify its general use.

Experimental abortion of bovines produced through vaginal transmission of trichomonads [trans. title], L. Riedmüller (*Schweiz. Arch. Tierheilk., 75 (1933) No. 9, pp. 457–461*).—This contribution is in continuation of those previously noted (E.S.R., 69, pp. 712, 713), being presented in connection with a list of eight references to the literature.

Trichomonas bovis infection in cattle, F. E. Walsh, S. H. McNutt, and C. Murray (*Cornell Vet., 24 (1934), No. 1, pp. 60–74, figs. 4*).—This contribution, the details of which are presented in tabular form, is in continuation of the work previously noted (E.S.R., 69, p. 713) and considers the subject in connection with a list of 11 references to the literature. Evidence is advanced showing the bull to be the carrier of the infection.

Johne's disease of cattle, G. Hilton (*Canada Dept. Agr. Bul. 167, n.ser. (1934), pp. 5*).—A practical account.

Clinical observations of lymphoid hyperplastic diseases of cattle, W. L. Boyd (*Cornell Vet., 24 (1934), No. 1, pp. 40–55, figs. 6*).—This contribution from the Minnesota Experiment Station reports upon observations of three cases of lymphoid hyperplastic diseases of cattle. The reports and specimens received, together with clinical observations, led the author to consider that these diseases are of common occurrence in the bovine.

Obtaining and maintaining a mastitis-free herd, C. S. Bryan and G. Fox (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 127–129*).—Practical directions are given for the securing and maintenance of a mastitis-free herd.

Contribution to the study of piroplasmoses in Greece.—IV, The piroplasmoses of bovines [trans. title], M. Stylianopoulos and B. Ananiadès (*Bul. Soc. Path. Expt., 26 (1933), No. 9, pp. 1153–1156*).—The piroplasmoses of bovines occurring in Greece (E.S.R., 70, p. 244), particularly in Macedonia and Thrace, are said to be similar to those met with in North Africa (E.S.R., 67, p. 743). A large number of cases have been transmitted by infected ticks from slaughterhouse cattle imported from Anatolia (Asia Minor). They are, in order of their frequence of occurrence and their economic importance, (1) babesiellosis due to *Babesiella berbera*, (2) true piroplasmosis due to *Piroplasma bigeminum*, (3) theileriosis due to *Theileria mutans*, (4) true theileriosis due to *T. dispar*, and (5) anaplasmosis due to *Anaplasma marginale*.

Screw-worm, a pest of ranch cattle in Southern Rhodesia, A. Cuthbertson (*Rhodesia Agr. Jour., 31 (1934), No. 2, pp. 100–111*).—This contribution, with a foreword by R. W. Jack, deals with the screw worm *Chrysomyia bezziana* Vill. in Southern Rhodesia, where, during the past 15 or 16 years, it has become of major importance to the ranching industry.

The size of the virus of louping-ill of sheep by the method of ultrafiltration analysis, W. J. Elford and I. A. Galloway (*Jour. Path. and Bact., 37 (1933), No. 3, pp. 381–392*).—The size of the virus of louping ill disease of sheep, an encephalomyelitis characterized by cerebellar ataxia and disorder of brain functions and long recognized in certain parts of Scotland and the north

of England, is estimated to be 15–20 mμ by the method of ultrafiltration analysis using carefully graded collodion membranes.

"The filtration end point has been checked both by inoculation of mice and of sheep. Filtrates infective for mice also proved to be infective for sheep. The virus was found to have retained its infectivity for sheep after having received 22 passages in mice over a period of 210 days, and also after 40 passages in mice extending over a period of 687 days. The virus quickly becomes inactivated when kept in broth at room temperature, 18° to 20° C. A suspension at pH 7.6, initially infective in 1:100,000 dilution, had dropped 90 percent in potency after 24 hr., and was completely noninfective after 3 days. The virus may be stored satisfactorily for much longer periods at 4°. Filtrates of broth suspensions at pH's 7.6 and 8.5, kept in small flasks closed with cotton-wool plugs, were found to be infective after 70 days. The virus exhibits greater stability in slightly alkaline broth, namely, at pH 7.5 to 8.5. Infection has been successfully transmitted to mice with filtrates by an intranasal instillation technic."

The influence of the nutritional state of the sheep on its susceptibility to infestation with the stomach worm, Haemonchus contortus, A. H. H. Fraser and D. Robertson (*Empire Jour. Expt. Agr., 1 (1933), No. 1, pp. 17–21, fig. 1*).—Studies made of the importance of nutrition in hemonchosis of lambs have shown that well-fed lambs have a higher degree of resistance to infestation than those poorly fed.

Contribution to the clinical study of the enteritis of lambs (enzootic paraplegia) [trans. title], H. Carré (*Rev. Gén. Méd. Vét., 42 (1933), No. 503, pp. 665–696*).—The author concludes that the disease of lambs which has been referred to as meningo-encephalitis and enzootic paraplegia is not an affection of the central nervous system as has been supposed, neither is it an infectious disease nor due to parasitic infestation. The primordial symptoms and lesions are said to be those of a toxic enteritis.

The diagnosis of hog cholera [trans. title], O. Waldmann (*Off. Internatl. Épizoot. Bul., 6 (1932), No. 1, pp. 41–58, figs. 3; abs. in Jour. Compar. Path. and Ther., 46 (1933), No. 4, pp. 275–281*).—A somewhat extended discussion of the subject.

Swine influenza, I–III (*Jour. Expt. Med., 54 (1931), No. 3, pp. 349–359, pls. 3; pp. 361–371, pl. 1; pp. 373–385*).—Three contributions are here presented.

I. *Experimental transmission and pathology*, R. E. Shope.—In experimental work, swine influenza was induced in pigs by the intranasal instillation of material from spontaneous cases of the disease as occurring epizootically in eastern Iowa, the experimental disease having the same features as the epizootic. "It has been maintained for study by serial passages accomplished either by intranasal instillation or by pen contact. Eight strains of the virus have been established experimentally during three epizootic periods. The clinical disease induced by these eight strains has been in general the same, although its severity and mortality have varied.

"The principal features of the pathology of swine influenza are an exudative bronchitis accompanied by marked damage of the bronchial epithelium and its cilia, a peribronchial round cell infiltration, and massive pulmonary atelectasis. The latter is modified somewhat by a round cell infiltration of the alveolar walls. The lymph nodes, especially the cervical and mediastinal ones, are hyperplastic and edematous. There is usually a mild to moderate, acute splenic tumor. The mucosa of the stomach and colon is congested.

"The pneumonia following swine influenza is, characteristically, lobular in type and of the same general distribution as the atelectasis. The nonpneumonic areas of lung are extremely edematous and congested."

II. *A hemophilic bacillus from the respiratory tract of infected swine*, P. A. Lewis and R. E. Shope.—The authors have regularly isolated a hemophilic bacillus in culture from the respiratory tract of a series of swine experimentally infected with swine influenza and from a small number of spontaneous field cases of the disease. The cultural and morphological characters of the organism are described, and the name *Hemophilus influenzae suis* is suggested. It has not been observed in respiratory tract cultures from a group of swine free from the disease.

"The organism exhibits marked serological diversity, since only two out of eight strains studied were serologically identical. It is usually nonpathogenic for rabbits and white rats and irregularly pathogenic for white mice. One strain of the organism was pathogenic for guinea pigs while two others were not. Eleven out of thirteen attempts to induce symptoms of disease in swine by intranasal inoculation with pure cultures of *H. influenzae suis* were entirely negative. The remaining two attempts which suggested a positive result have been discussed. Attention has been called to the marked similarity which exists between non-indol-producing strains of *H. influenzae* and *H. influenzae suis*."

III. *Filtration experiments and etiology*, R. E. Shope.—In the work here reported the author demonstrated, in Berkefeld filtrates of infectious material from experimental cases of swine influenza, a virus which when administered intranasally to susceptible swine induced a mild, usually afebrile illness of short duration. "The changes in the respiratory tract resembled those in swine influenza but were usually much less extensive. When the filtrable virus was mixed with pure cultures of *H. influenzae suis* and administered to swine a disease identical clinically and pathologically with swine influenza was induced. The data presented indicate that the filtrable virus of swine influenza and *H. influenzae suis* act in concert to produce swine influenza, and that neither alone is capable of inducing the disease.

"One attack of swine influenza usually renders an animal immune to reinfection. Blood serum from an animal made immune in this way neutralizes infectious material from swine influenza in vitro, as shown by the failure of the mixture to produce disease in a susceptible animal. The virus can be stored in a dried state or in glycerol for several weeks at least. In one instance dried material apparently retained both the virus and *H. influenzae suis* in viable form for a period of 54 days. Fatal cases of experimental swine influenza have been observed in which *H. influenzae suis* was the only organism that could be cultivated from the respiratory tract. Attention has been called to some features of marked similarity between epizootic swine influenza and epidemic influenza in man."

Swine influenza.—V, Studies on contagion, R. E. Shope (*Jour. Expt. Med.*, *59 (1934), No. 2, pp. 201–211*).—In continuation of the earlier studies, including those above noted (E.S.R., 68, p. 532), the author reports having observed a strain of swine influenza "to change from a condition of full contagiousness, in which both *H[emophilus] influenzae suis* and the swine influenza virus were transferred by pen contact, to one of only partial contagiousness, in which the virus alone was transferred, resulting in the mild filtrate disease instead of swine influenza in animals infected by contact. Swine that had been experimentally converted into carriers of *H. influenzae suis* developed swine influenza following contact with animals infected with the altered strain of the disease. Experiments in which the etiological components of a freshly obtained and fully contagious strain of swine influenza were substituted for the corresponding components of the altered strain of the disease revealed the fact that the change in the contagious character of the latter was due to an alteration

in the bacterial component of the etiological complex, and that the virus component was in no way responsible."

The etiology of bursati, S. C. A. DATTA (*Indian Jour. Vet. Sci. and Anim. Husb., 3 (1933), No. 3, pp. 217–236, pls. 6*).—The investigation reported has shown bursattee, known in India since 1829, to be a habronemic granuloma of equines, most probably due to *Habronema muscae* Carter and involving the skin and internal organs such as the lung. "The disease is more than a mere local infection, the causative larvae exhibiting considerable migratory powers. In the majority of cases skin lesions would appear to be produced through the general circulation, wound infection playing an insignificant role."

Salmonella aertrycke in colitis of foals, P. R. EDWARDS (*Jour. Infect. Diseases, 54 (1934), No. 1, pp. 85–90*).—Contributing from the Kentucky Experiment Station, the author reports upon an outbreak of infectious colitis among suckling foals in which *S. aertrycke* was isolated from all the fatal cases and from certain infected animals which recovered. A vaccine prepared from cultures of the organism appeared to have some value in controlling the infection.

Serological distinctions between the viruses of encephalitis in St. Louis, 1933, equine encephalomyelitis, and vesicular stomatitis, H. R. COX and G. L. FITE (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 499, 500*).—In experiments in which a mouse strain of encephalitis virus, a neurotropic guinea pig strain of equine encephalomyelitis virus of the western type, and similar mouse strains of the New Jersey and Indiana types of vesicular stomatitis virus were employed, no cross-immunity reactions occurred in any of the viruses studied.

The immunological relationship of eastern and western strains of equine encephalomyelitis virus, L. T. GILTNER and M. S. SHAHAN (*Science, 78 (1933), No. 2034, pp. 587, 588*).—The authors have compared a strain of the equine encephalomyelitis virus, isolated during the epizootic which invaded sections of Delaware, Maryland, and Virginia in the summer of 1933, with a South Dakota strain of the virus isolated in 1932. Their preliminary immunological observations indicate that the eastern strain of the virus is not identical with the western virus with which it was compared. The eastern virus disease in guinea pigs was found to be of a more acute type than the western virus infection, and the viruses were found to show certain immunological differences.

The variability and ultrafiltrability of the virus of equine infectious anemia [trans. title], KRÁL (*Rec. Méd. Vét., 109 (1933), No. 12, pp. 912–919, figs. 2*).—The author finds the virulence of the filtrable virus of equine infectious anemia to vary considerably. Controlled experiments with artificial infection consisting in the subcutaneous injection of the ultrafiltrate from virulent blood have shown that the virus is not ultrafiltrable. It appears that the virus is absorbed by the albumin of the blood cells on serum and is retained by the albumin in the ultrafiltration process. It was found that with horses suffering from infectious anemia the urine, like the blood serum, is not infective unless albumin is present.

The microscopic anatomy of the digestive tract of Gallus domesticus, M. L. CALHOUN (*Iowa State Col. Jour. Sci., 7 (1933), No. 3, pp. 261–304, pls. 39*).—This is a detailed report of a microscopic study of the entire digestive tract with its appendages made on chickens of different ages, presented in connection with a 13-page list of references to the literature.

Virulence of Salmonella pullorum, W. N. PLASTRIDGE and L. F. RETTGER (*Jour. Infect. Diseases, 54 (1934), No. 1, pp. 23–34*).—In studies conducted at the [Connecticut] Storrs Experiment Station, "marked differences were observed in the virulence of individual strains of *S. pullorum* for chicks, adult fowl, rabbits, and guinea pigs. Some strains were found to be highly virulent

for both chicks and adult birds; others possessed a low degree of pathogenicity for chicks but were highly virulent for adult birds; and still others were relatively avirulent for both young and adult chickens.

"The data presented suggest that pronounced changes can be induced in the virulence of some strains of *S. pullorum* by the action of bacteriophage. One particular strain which was moderately virulent for chicks and only slightly virulent for adult birds was rendered practically avirulent for chicks and highly virulent for adult birds by treatment with bacteriophage. This condition appeared to be dependent on the establishment of a certain balance between the activity of the bacteriophage and the growth of cells.

"In general, passage through animals had no appreciable effect on the morphologic, colonial, and agglutinative characteristics of the variants employed. The feces of adult birds artificially infected with *S. pullorum* were found to contain the pullorum organism at irregular intervals when examined from 102 to 194 days following exposure."

Strategy for war on poultry parasites, E. B. Cram (*East. States Coop., 10 (1934), No. 1, pp. 4, 5, 20, 26, figs. 4*).—This is a practical discussion illustrated by several figures which include a diagram showing the route by which eggs or larval forms of parasites leave the body of an animal and, subsequently, the route traversed before they again enter the body of a susceptible animal.

Campaigns against poultry parasites, E. B. Cram (*U.S. Egg and Poultry Mag., 40 (1934), No. 3, pp. 30–33, 62, 63, fig. 1*).—This is a practical account based in part upon the contribution above noted.

Internal parasites of poultry, E. B. Cram (*East. States Coop., 9 (1933), No. 12, pp. 8, 9, 20, 22, figs. 8*).—A practical account.

The genera Heterakis and Pseudaspidodera in Indian hosts, P. A. Maplestone (*Indian Jour. Med. Res., 20 (1932), No. 2, pp. 403–420, pls. 3*).—This contribution reports upon identifications made of nematodes collected over a period of several years from birds dying in the Calcutta Zoological Gardens and from 100 domestic fowls purchased in the Calcutta market. Thirty of the domestic fowl were found harboring one or more species of *Heterakis*. The findings, the details of which are presented in tabular form, include 12 species of *Heterakis*, of which 2 are described as new, and 3 species of *Pseudaspidodera*, of which 1 is described as new.

Endemic paratyphoid infection in turkeys, L. F. Rettger, W. N. Plastridge, and R. Cameron (*Jour. Infect. Diseases, 53 (1933), No. 2, pp. 272–279*).—In work conducted by the [Connecticut] Storrs Experiment Station and Yale University, "a paratyphoid-like organism was isolated from turkey poults of various ages which were sent to the laboratory from two widely separated turkey farms. Large losses were sustained by the owners through annually recurring epizootics which affected the young turkeys, particularly the very small poults. A general systematic study, including the application of the agglutinin absorption test, established the organism as being of the *Salmonella aertrycke* type. It was highly virulent for young turkeys, and for chicks, mice, and guinea pigs when administered orally. An inquiry into the history of the two turkey farms and the endemics gave strong indication that the disease had been brought to farm B through small poults which were purchased from farm A. The mortality on both farms was very high."

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Indiana Station] (*Indiana Sta. Rpt. 1933, pp. 6–10, figs. 4*).—The progress results are briefly presented of investigations on the combined harvester-thresher, soil erosion

prevention by Mangum terraces, the field silage harvester, the heating of poultry houses, the drying of hay, corn production by mechanical methods, a trash-covering shield for plows, mechanical corn picker losses, low pressure pneumatic tires for tractors, and the use of electricity for pumping and heating water, milking cows, heating dairy sterilizers, soils, and storage rooms, and operating hay chopping machines.

[Irrigation investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1933, pp. 62–69, fig. 1*).—The progress results are reported of investigations in cooperation with the U.S.D.A. Bureau of Agricultural Engineering on duty of water for cabbage, rate and cause of rise of ground water in the Mesilla Valley, potato culture under irrigation, water requirements and the economical use of water for cotton, and the effect of fertilizers and frequency of irrigation on yield and the keeping and marketing qualities of the Early Grano onion.

[Agricultural engineering and soil erosion investigations at the Washington Station], L. J. Smith, H. L. Garver, J. C. Knott, C. A. Larson, W. A. Rockie, C. E. Deardorff, A. J. Johnson, A. L. Hafenrichter, and P. C. McGrew (*Washington Sta. Bul. 291 (1934), pp. 10, 11, 54–56, 59–62, 63, 64*).—The progress results of investigations on the loss of water from sprinklers by evaporation; warming water for dairy cows; orchard irrigation moisture relations; irrigation experiments with alfalfa, potatoes, corn, and wheat; salt content of irrigation waters; specific conductance of strawberry clover pastures; hardpan conditions on irrigated orchard plats clean cultivated and in alfalfa; vegetative control of soil erosion; perennial grasses, alfalfa, and sweetclover for erosion control; terracing and operation of machinery on terraced land; tillage and date of planting experiments; utilization of clay points by planting to timber cover; and protective strips of wheat in summer fallow.

The dynamic properties of soil.—V, Dynamics of soil on plow moldboard surfaces related to scouring, R. D. Doner and M. L. Nichols (*Agr. Engin., 15 (1934), No. 1, pp. 9–13, figs. 4*).—In a fifth contribution to the subject by the Alabama Experiment Station (E.S.R., 68, p. 387), data are presented on the development of plows which will scour in the sticky soils of the Southeast and a remedy is suggested for scouring troubles so far as shape of moldboard is concerned. The entire presentation is based upon a mathematical analysis of reactions along the path of travel of the furrow slice over the surface of the moldboard.

From a study of forces on the moldboard surface a linear differential equation is developed from which can be found the tangential force necessary to maintain motion in terms of friction, length, curvature of the moldboard, and weight of the soil at any point along the path of travel. A method of utilizing this formula is included. It is shown that high curvature in the path near the share results in increased tendency for the soil to stick to the moldboard. If the curvature is shifted towards the wing of the moldboard, this tendency is materially reduced. An approximate formula for scouring is given. Field tests of plows having these features were made and the conclusions of the mathematical study found to hold in practice.

Rammed earth for farm building walls, R. L. Patty (*Agr. Engin., 15 (1934), No. 1, pp. 14, 15, 17*).—A brief description is given of the character, scope, and progress of the investigations being conducted at the South Dakota Experiment Station on the use of rammed earth for the walls of farm buildings.

A very definite relationship has been found between the amount of sand in the soil and the amount of shrinkage cracks or checks in rammed earth

walls. An even more definite relationship has been found between the moisture in the soil at the time of ramming and the amount of shrinkage cracks. In general, soils containing less than 35 percent of sand will shrink and crack when rammed into a wall with the optimum amount of moisture, while soil containing more than 85 percent of sand will not stand in a wall for long against the weather, at least not without a protective covering.

Protective coverings for rammed earth walls have been found to be highly desirable. Coverings on the north exposures were found more durable than those on south exposures, whereas exactly opposite results were obtained with unprotected walls. Linseed-oil paints and plasters are the only types of protective coverings that have shown permanently favorable results.

The optimum moisture content found for rammed earth walls varied from 7 to 16 percent, depending upon the amount of sand in the soil. Seven percent of moisture will be optimum for a soil containing 70 to 80 percent of total sand, while 16 percent will be about optimum for soil containing as low as 5 to 10 percent of total sand.

The strength of rammed earth walls was found to vary directly with the intensity of ramming.

Studies of the effect of size and amount of aggregate in soil on the strength of the walls led to the conclusion that too much coarse aggregate is not favorable for pisé work, although pebbles as large as a man's fist do no harm in the wall if there are not many of them. In fact, the best weathering wall contains aggregate that is as uniformly graded as for concrete work.

The addition of hydrated lime to the soil for pisé work reduced the strength of the blocks in compression, and the present indications are that it also reduces resistance to weathering. The strength of the test blocks was materially increased by the addition of any fibrous material. This increase in strength averaged between 20 and 25 percent. The reinforcing materials tried included metal lath or expanded metal, barbed wire with hooked ends, barbed wire with straight ends, one-fourth-inch round rods with straight ends, one-half-inch round rods with hooked ends, one-half-inch round rods with straight ends, and one-inch boards. The rods gave the best results, and the larger the rod used the stronger the beam. The barbed wire with hooked ends gave some increase in strength, while the straight barbed wire and the metal lath decreased the strength.

Public Roads, [March 1934] (*U.S. Dept. Agr., Public Roads, 15 (1934), No. 1, pp. 1–28+[2], figs. 37*).—This number of this periodical contains the current status of U.S. Public Works road construction as of February 28, 1934, and the following articles: A Study of Hydraulic Fill Settlement (pp. 1–9) and Frost Heave in Highways and Its Prevention (pp. 10–16, 25), both by H. Aaron; and Laboratory Tests of Resilient Expansion Joint Fillers, by D. O. Woolf and D. G. Runner (pp. 17–25).

The physical-chemical properties of ethyl alcohol gasoline systems.—IV, Influence of alcohol concentration upon specific volume, fluidity, air-to-fuel ratio, calorific value, latent heat, and fall in temperature on evaporation, L. M. Christensen, R. M. Hixon, and E. I. Fulmer (*Iowa State Col. Jour. Sci., 8 (1934), No. 2, pp. 245–250*).—In further studies conducted at the Iowa State College, it was found that systems of ethyl alcohol and gasoline expand on mixing. The maximum expansion is 0.2–0.3 percent at 4–30 percent alcohol. The density of the 10 percent alcohol blend is about 0.6 percent greater than for the basal gasoline. This difference is well within the limits of variation for various gasolines.

Neither the viscosities nor fluidities are additive. Systems containing up to 6 percent alcohol have lower viscosities and higher fluidities than either

the alcohol or gasoline alone. Up to 20 percent alcohol the fluidities are greater but from 20 percent up to 50 percent alcohol (the highest concentration used) less than when calculated on the additive basis. The viscosity of the 10 percent blend is only 3 percent greater than for gasoline and well within the limits of variation for various gasolines. The air-to-fuel ratio of a 10 percent blend is about 4 percent lower than for gasoline, while the variation among gasolines may be 5 percent.

The calorific value of the 10 percent blend is 3 percent less than for the base gasoline, while the variation among gasolines may be 7 percent. Data calculated for the latent heats and fall in temperature upon evaporation for the various blends show that with the blends there will be a greater heat input to the intake manifold, which is equivalent to an increase in heat content.

All these data indicate that the carburetor setting for a 10 percent blend should be the same as for gasoline and that the same air-to-fuel ratio would result. This is in harmony with data from dynameter and road tests.

Multi speed reduction unit with direct drive for electric motor operation, H. J. GALLAGHER (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 130–132, figs. 2*).—The assembly of this unit is briefly described and illustrated.

Wheel and bearing equipment for farm wagons and trailers, E. A. SILVER (*Agr. Engin., 15 (1934), No. 2, pp. 59, 60, fig. 1*).—Studies of the draft of wheel equipment for farm wagons and trailers conducted at the Ohio Experiment Station are briefly summarized. The wheels were tested on meadow, cultivated soil, cinders, gravel, and concrete roads. The net loads varied from 2,000 to 5,000 lb. and the rates of travel from 2.5 to 20 miles per hour. The wheel tires were of steel and rubber.

The cultivated soil required the greatest draft, followed in order by meadow, gravel, cinder, and concrete roads. On four of the five tractive surfaces and at all loads and rates of travel, the low-pressure pneumatic tire required less draft than any of the other types of wheels tested. The only exception was on concrete road, where there was very little difference between the steel wheel and the low-pressure pneumatic tire. The greatest difference in draft between the low-pressure pneumatic tire and the steel wheel occurred on gravel roads.

The importance of wheel diameter depends largely upon the tractive surfaces over which the load is transported. In cultivated soil, however, the smaller diameter wheels required more draft, ranging from 1 to 16 percent more and depending upon the weight of the load transported and the rate of travel. On hard-surfaced roads or even in meadow, very little difference in draft was noted.

The width of rim seems to be a factor in cultivated soil only. With loads weighing from 5,000 to 6,000 lb. the 6-in. rim gave a slight advantage. The 5-in. rim excelled at all loads weighing below 5,000 lb. Wheels equipped with roller bearings show a decided decrease in the draft of the wagon. On cinder road the wagon skein type of bearing required the greatest draft, while the taper-roller bearing required the least.

A comparative study of pneumatic tires and steel wheels on farm tractors, C. W. SMITH and L. W. HURLBUT (*Agr. Engin., 15 (1934), No. 2, pp. 35–48, figs. 43*).—Tests were conducted at the Nebraska Experiment Station on various farm operations, including cultivating listed corn the first, second, and third times; mowing and sweeping alfalfa and wild prairie hay; binding oats; combining wheat; plowing barley and wheat stubble, sweetclover, and alfalfa sod; drilling wheat; and picking corn.

The rubber-tired tractor was harder to hold on listed corn ridges when cultivating than a tractor equipped with steel wheels and spade lugs. There

was little difference in the ease of handling or of riding qualities between tractors equipped with rubber tires and those equipped with steel wheels when cultivating corn, except when on the ridges. The riding qualities of a tractor equipped with rubber tires are very much better than those of one equipped with steel wheels and lugs when going to and from fields and when traveling on the road. The rubber-tired tractor is also considerably the better all round for haying operations.

A very considerable saving in time and in fuel can be made on many operations by the use of rubber tires. Ample evidence was secured that a tractor will take in high gear with rubber tires that which made a full load in intermediate gear with steel wheels and lugs. Front tire pressures should not be as low as 15 lb.; 26 lb. was found very satisfactory. It would seem that the design of tread on a front tire should be different from that on a rear tire to correspond with the difference in duty of the two. Field conditions were encountered with a combine following rains, also with a plow, where the rubber tires slipped. Steel wheels and spade lugs were more satisfactory in these conditions. A set of lug chains is fairly simple to install and makes it possible to work in such conditions when possible to work with other wheel equipment.

In applying rubber tires to tractors it is necessary in some cases to widen the tread (the distance from the center of one rear tire to the center of the other). This handicaps the rubber tires when making comparisons between them and steel wheels. Within the limits of its tractive effort a pneumatic tire is more efficient in transmitting power than a steel wheel and spade lugs.

Brakes on tractors will need to be improved when rubber tires are used. This is made necessary not only by the increased road speeds but also by the tendency of a rubber-tired tractor to coast at the ends of rows after implements have been raised.

Further tests to determine the best inflation pressure to use for tractor tires showed that these pressures have very little effect on fuel consumption. The speed decreases quite regularly as the pressure is decreased, also as the drawbar load increases. The percentage of travel reduction increases with decrease in tire-inflation pressure, also with the increase in drawbar pull. Maximum drawbar horsepower decreased with a decrease in tire-inflation pressure. A change in footing from the tractor-testing course to a stubble field made very little difference in the maximum drawbar pull with pneumatic tires, but did make a considerable difference for steel wheels and lugs.

Comparative field tests in Kansas of rubber tires and steel wheels, F. J. Zink, E. L. Barger, J. Roberts, and T. E. Martin (*Agr. Engin., 15 (1934), No. 2, pp. 51–54, figs. 3*).—The results of a series of comparative tests at the Kansas Experiment Station to determine the relative merits of pneumatic rubber tractor tires and regular steel-wheel equipment are reported. Thirteen separate tests were conducted in three fields of different characteristics and soil type.

Rubber tires were more efficient at higher speeds. Decreased rolling resistance, averaging but 47.41 percent of that of regular steel wheels, was the largest single factor responsible for the increased efficiencies of the rubber tires. Slippage of the rubber tires was 16.6 percent less than that of steel wheels. Jarring and vibration when operating over hard or rough ground were eliminated with rubber tires, and under most conditions the comfort of the operator was greatly increased. Certain field conditions such as cross-travel on row-crop fields resulted in rebounding or bouncing with rubber tires that was more severe than with steel wheels. Certain load conditions, in some

cases near the full-load point, also produced rhythmic rebounding with rubber equipment.

Relative efficiencies of rubber tires and steel wheels were greatly affected by tractor speeds, loads, and ground conditions. The greatest differences appeared when conditions were such that it was possible to handle the load at a higher speed with the rubber tires. Fuel savings made possible by the use of rubber tires averaged 12.98 percent for the nine tests, this saving being due largely to the decreased rolling resistance.

Rubber tires caused much less dust to be stirred up in dry fields. In some of the tests with steel wheels it was necessary to stop and let the dust clear away in order to see to turn at the ends, while with rubber tires this was not necessary.

Tractive performance of pneumatic tires and steel wheels, B. D. Moses and K. R. Frost (*Agr. Engin., 15 (1934), No. 2, pp. 55–57, figs. 7*).—Tests at the California Experiment Station to compare the performance of rubber tires and steel wheels with lugs for tractors are reported.

The results showed that the pneumatic rubber tire had a decided advantage over the steel wheel in fuel consumption at higher speeds. A higher percentage of the rated drawbar pull can be developed in second and high gears with the rubber tires. Steel wheels with lugs showed a higher percentage of drawbar pull in low gear. Slippage is the controlling factor limiting the load drawn with rubber tires, while the steel-wheeled tractor is limited by the power of the engine. The maximum horsepower is increased when the gear changes are made to higher speeds with the rubber-tired tractor. It is decreased with steel wheels. At any given percentage of rated drawbar pull the rubber-tired tractor is more economical for each gear ratio on either firm or cultivated soil. The fuel required to move the tractor without load is less with the rubber tires than with steel wheels and lugs. The rubber tires roll with less resistance on firm soil; the steel wheels, on cultivated soil.

Pneumatic tires vs. steel wheels for tractors, R. H. Wileman (*Agr. Engin., 15 (1934), No. 2, pp. 62, 63, fig. 1*).—Comparative tests of steel wheels and lugs with low-pressure pneumatic tires on tractors, conducted under actual field working conditions at the Indiana Experiment Station, are reported briefly.

The results show that when equipped with pneumatic tires the tractor pulled the same load at a faster speed than when steel wheels were used. The amount of fuel required for plowing was reduced 13.9 percent with the large tractor and 14.3 percent with the small tractor in high gear by the use of pneumatic tires. With low speeds and heavy loads the amount of fuel saved by pneumatic tires over steel wheels is considerably reduced. The power consumed to overcome the rolling resistance of the tractor itself when equipped with pneumatic tires was reduced 60.8 percent for the large tractor and 43 percent for the small tractor. A saving of 20 percent in fuel was secured by the use of pneumatic tires for cultivating. In plowing sod with considerable growth, or when the surface was slick, the use of skid chains was necessary to secure sufficient traction.

Field test of rubber-tired tractor wheels, R. I. Shawl (*Agr. Engin., 15 (1934), No. 2, pp. 57, 58*).—Tests conducted at the Illinois Experiment Station are briefly reported. The results showed little difference in fuel consumption with the two types of wheels. The advantage of increased working speed of the tractor due to the rubber tires is shown by a gain of 0.35 acre plowed per hour for the rubber-tired wheels and a saving of 0.37 gal. of fuel per acre plowed.

Idaho drawbar tests of rubber tires, H. BERESFORD (*Agr. Engin., 15 (1934), No. 2, pp. 65, 68*).—Tests conducted at the Idaho Experiment Station on the effect of different types of traction wheels on the maximum drawbar pull developed by a wheel type tractor are reported. The wheels included steel and low-pressure rubber tires and were tested on grass sod; hard, graveled road; pavement; and soft, loose oat stubble.

It was found that the no-load distance traveled by the tractor in 10 revolutions of the drive wheels, when equipped with pneumatic tires on the four surfaces, was approximately the same. However, the distance traveled with cleated wheels was considerably greater than with pneumatic tires at no load. With a dynamometer reading of 1,000 lb., for the same gear and surface conditions, the slippage of the pneumatic wheels on the sod surface was 3.67 percent in one trial and 6.45 percent in another, as compared with 2.84 percent for the spade lug equipped wheels. On the same field for third-gear operation the spade lugs had the advantage over the rubber-tire-equipped wheels by 400 lb. and also showed a much lower percentage of slippage than did the pneumatic tires. During this latter trial the tread width of the pneumatic tires increased from 12 to 13 in.

On the softer oat stubble there was a slight advantage in favor of spade lug wheels for second-gear operation. Here again the pneumatic tires showed the larger percent of slippage. One trial in second gear with pneumatic tires gave a maximum pull of 1,700 lb. as compared with 1,800 lb. for low gear with the steel wheels.

Increasing the weight on the pneumatic tires by the addition of the two 150-lb. wheel weights increased the maximum drawbar pull by approximately 300 lb., the weight added. After the wheel weights were added, the maximum pull on the oat stubble was 2,000 lb. as compared with 1,800 in low gear for the spade lug wheels. In this case the percent of slippage for the pneumatic tires was 14.8, while the tread width increased from 12 to 13.5 in. Here again the slippage for the cleated wheels was less, being only 6.6 percent.

The greatest maximum pull with pneumatic tires was recorded when the tractor was operated on hard road and pavement. During one trial a maximum pull of 2,600 lb. in second gear was recorded for the pneumatic tires when operating on concrete pavement which had a rather badly worn bitulithic top.

The data taken during this trial indicate that the pneumatic and spade lug wheels each have a particular field of application. When operated on slippery surfaces such as a grassy field or on ground soon after a rain the steel wheels proved superior to the pneumatic wheels. On harder surfaces, such as pavement, hard roads, or fields that are dry, the pneumatic wheels showed a marked superiority over cleated wheels.

Wisconsin observations of rubber tire performance, F. W. DUFFEE (*Agr. Engin., 15 (1934), No. 2, pp. 58, 59*).—Tests conducted at the Wisconsin Experiment Station are briefly reported. The conclusion is drawn that for the man who has considerable custom work to do, such as threshing, silo filling, or other work that takes him on the highway, rubber tire equipment would be of great value and very probably would be the equipment for him to purchase. The advantages of rubber tire equipment under these conditions would more than offset the disadvantages of the rubber tire equipment for field conditions. On the other hand, for the man who has only work on his own farm to do, or where practically all of it is confined to his own farm, the steel tire equipment would be economically and mechanically superior to rubber tire equipment.

Tractor tests of steel and rubber tires, R. A. Hardy (*Agr. Engin., 15 (1934), No. 2, pp. 70, 71, fig. 1*).—Tests conducted at the University of Saskatchewan are reported.

The data show that the speed with the steel equipment, because of the firm soil, was 4.1 miles per hour on high as compared with 3.52 miles per hour with the rubber. The steel wheels showed a negative slip at the rim and a positive slip at the tip of the lugs amounting to —4.48 and 12.12 percent, respectively, as compared with 5.85 percent slip with the rubber tires. The fuel economy of the tractor was 1.6 lb. of fuel per drawbar horsepower-hour with steel wheels and 1.47 lb. with the rubber tires. The maximum working load in intermediate gear was 2,400 lb. with steel wheels as compared with 2,100 lb. with rubber tires. An air pressure of 12.5 lb. was more satisfactory than 20 lb., and probably even lower pressure should be used to obtain the most satisfactory results because no deflection was noticed at any time with the tires inflated to 12.5 lb. pressure.

The rubber equipment resulted in a marked improvement in operating conditions by reducing the dust and materially improved the quality of tillage.

Tests in Texas of pneumatic tractor tires, F. R. Jones (*Agr. Engin., 15 (1934), No. 2, pp. 72, 73, figs. 5*).—Tests conducted at the Texas Experiment Station are summarized. These were conducted on sod and loose cultivated soil.

Steel wheels and spade lugs gave a greater maximum drawbar pull than pneumatic tires on both sod and plowed ground. If the radius of the steel wheel is considered to be constant and the change in radius of the rubber-tired wheel taken into account, the steel wheels and the rubber-tired equipment give approximately the same percentage of slippage from 1,200 to 1,800 lb. when on Bermuda sod. On Bermuda sod the 12 lb. air pressure gave considerably better traction than the 20 lb. air pressure. The tractor pulled more and gave less slippage on Bermuda sod with both types of wheel equipment. On rough sod there was considerable bouncing on the rubber-equipped tractor which tended to increase the slippage. The use of chains on Bermuda sod did not seem to produce any appreciable improvement in the traction. This was probably due to the fact that the chains had a tendency to keep the tires from making proper contact with the ground. On the plowed ground there was very little difference as to the slippage and the load as far as the change in air pressure was concerned. The tires, although they were slipped considerably on sand and gravel, did not show an appreciable amount of wear. Small changes of moisture content of the top layer of the soil made more difference in the slippage of a rubber-equipped tractor than the steel wheel tractor. The tests indicated that when pulling the same load at different speeds there was an increased slippage with increased speed.

Tests of pneumatic and cushion rubber tires for tractors, A. W. Clyde (*Agr. Engin., 15 (1934), No. 2, pp. 69, 71, fig. 1*).—Tests conducted at the Pennsylvania Experiment Station are reported in which a general-purpose tractor was used on plowing and disking.

The cushion rubber tires plowed with 16.5 percent less fuel and disked the freshly plowed ground with 28 percent less fuel than regular 10-in. face steel wheels with 5-in. lugs. This work was mostly done in the same gear, but it was necessary to change to a lower gear part of the time with steel wheels. The cushion tires seem to have two main advantages over pneumatic tires—first, there is no inflation to watch nor possible trouble with punctures, and second, there is little objectionable recoil or bouncing on rough surfaces.

Farm tests of low-pressure tractor tires, F. W. Hawthorn (*Agr. Engin., 15 (1934), No. 2, pp. 61, 63*).—Tests of the comparative efficiencies of steel and low-pressure pneumatic tires for tractors under actual farm conditions are briefly reported, indicating that a rubber-tired tractor will turn out around a quarter more work in a given time than the same machine equipped with steel wheels, and this with a corresponding fuel saving. When working on hills rubber tires not only add greatly to the surplus power so badly needed on steep grades, but they also materially improve the steering and general handleability of the tractor on steep side slopes.

Plowing with rubber-tire-equipped tractor, A. J. Schwantes (*Agr. Engin., 15 (1934), No. 2, pp. 66–68, figs. 3*).—Studies conducted at the Minnesota Experiment Station of the plowing performance of a wheel type tractor equipped with standard wheels and lugs, with pneumatic tires, and with cushion rubber tires are reported.

The results show that the difference in the efficiency of pneumatic tires and zero-pressure tires is not significant, at least in view of only one test, but there is a significant difference between the performance of the tractor when equipped with rubber tires and when equipped with steel wheels and lugs.

Slippage was consistently less with lower air pressure in the tires. The data appear to indicate that beyond a certain point the addition of weight to the tractor would be ineffective. This appears to be especially true for the tests with low air pressure in the tires. It was found that the slippage of the land wheel under conditions of the test was consistently higher than that of the furrow wheel. The relative difference remained about the same for various weights of the tractor. The average of all of the tests with the same tractor weight showed that the slippage of the land wheel was 39 percent greater than that of the furrow wheel when 420 lb. were added to the land wheel and 280 lb. to the furrow wheel. When 140 lb. were added to the land wheel and no additional weight was added to the furrow wheel, the slippage of the land wheel was 0.38 percent greater than that of the furrow wheel. There appears to be considerably more slippage on loose ground than where the land is hard when no other factors influence. This is especially true when tire pressures are low. The difference is not so marked for the higher pressures, and it is significant that the reverse is true for the tires at the high pressures when no additional wheel weights are added to the tractor.

The tractor equipped with rubber tires cannot be used without chains when the ground is wet and slippery. As soon as the ground has dried to a certain point the traction will again be adequate. The zone defined by the conditions under which the final change takes place is very narrow.

The status of research on plowing problems, I. F. Reed (*Agr. Engin., 15 (1934), No. 1, pp. 3–6, figs. 2*).—In a brief contribution from the U.S.D.A. Bureau of Agricultural Engineering a summary is presented of some of the more important investigational work on plowing. A bibliography of 29 references is included.

Check wire with a four-row corn planter, C. K. Shedd (*Agr. Engin., 15 (1934), No. 1, pp. 18–20, figs. 4*).—Studies conducted by the Iowa Experiment Station in cooperation with the U.S.D.A. Bureau of Agricultural Engineering are briefly reported which were based on both graphical analysis and field tests of wire positions, wire movement, and wire tension.

The cross-over method seems to be adapted only to mounted planters. Theoretically, a perfect check can be secured in all parts of the field by this method. In practice, good results are secured with the cross-over by careful adjustment and operation provided the land surface is level or gently rolling.

By a method permitting constant angularity of the check wire most of the way across the field and by taking care of the rapid increase in angularity of the wire during the last few feet of the row by use of a "pay-out" stake, is was found theoretically possible to get a perfect check in all parts of the field. Wire and stake manipulation consumes a minimum amount of time, and the necessity for great care or skill on the part of the operator is eliminated. The method seems to offer very good possibilities of producing accurate check planting. It may be used equally as well with either mounted or pull type planters.

Home made feed mixer, H. J. Gallagher (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 133–136, figs. 2*).—The development of this mixer is described and the perfected equipment diagrammatically illustrated. Information is given on its operation, and a bill of materials is included.

A hypochlorite feeding device, F. R. Shaw, R. W. Kehr, and E. T. Matthews (*Amer. Jour. Pub. Health, 23 (1933), No. 10, pp. 1075–1080, fig. 1*).—This device is described and illustrated, and data on its use are presented. The principle involved is that of syphoning the hypochlorite solution from a container or containers and delivering it through a stopcock, a capillary tube, and a chlorine-resisting hose to the point of application.

Interior water supply piping for residential buildings, F. M. Dawson and J. S. Bowman (*Wis. Engin. Expt. Sta. Bul. 77 (1933), pp. 54, pl. 1, figs. 24*).—The purpose of this bulletin is to present a logical method for the design of the interior water supply piping for buildings. It is written primarily for those engaged in such work who lack a knowledge of the theory of hydraulics. While the treatment is from the practical standpoint, a sound theoretical basis is preserved throughout. Data are included in the form of diagrams and tables which represent the results of extensive experiments on friction loss in pipe, fittings, and fixtures which have been made at the University of Wisconsin during the past three years. Illustrative problems and discussions are included which are confined largely to piping for residences of moderate size.

AGRICULTURAL ECONOMICS

Proceedings of the Fifteenth International Congress of Agriculture, Praha (Prague), June 5–8, 1931 (*15. Congrès International d'Agriculture, Praha, 1931. Actes. Praha: Impr. Orbis, 1931, vols. 1, pp. [9]+265+48, [pl. 1, figs. 69]; 2 pp. [6]+770, [pls. 6, figs. 62]; 3, pp. [10]+756, [pls. 5, figs. 82]; 4, pp. [10]+768, [pls. 14, figs. 16]*).—The four volumes include the proceedings of the Congress held at Praha, Czechoslovakia, June 5–8, 1931, as follows:

Vol. 1. The preparatory work, organization, program, membership, etc., of the Congress.

Vol. 2. Reports presented, discussions, communications, etc., in the sections on agricultural policy and rural economics and teaching and diffusing information on different phases of the following subjects: The Possibilities of Organizing Agricultural Production in Different Countries with a View to Equalizing the Supply and Demand, by O. de Frangeš et al. (pp. 5–135); To What Extent and by What Means Can the Costs of Producing Wheat Be Reduced by Rationalization of Labor Conformable to the Importance of Agricultural Cultivation? by L. W. Ries et al. (pp. 137–251); The Importance and Possibility of Research on Prices and Price Forecasting in Agriculture, by A. Hobson et al. (pp. 253–335); communications on the above subjects (pp. 337–443); Agricultural Consultation Services, Methods Used, and Results Obtained, by E. Fileni et al. (pp. 471–623); New Methods of Diffusing Infor-

mation—The Radio, Films, Expositions, etc., by N. Gijsen et al. (pp. 625–723); and communications on teaching and diffusing information (pp. 725–756).

Vol. 3. Reports, etc., are presented on agricultural cooperation and vegetable production on the following subjects: Instruction in Cooperation, Methods Used, and Results Obtained, by O. Gennes et al. (pp. 3–110); Status of the Review of Agricultural Cooperation and the Improvements Resulting, by F. Klindera et al. (pp. 111–291); communications on agricultural cooperation (pp. 293–370); Legal Protection of New Varieties of Vegetables from the National and International Point of View, by E. Schribaux et al. (pp. 391–456); The Status of the Question of Soil Inoculation, by M. Düggeli et al. (pp. 457–544); and communications on vegetable production (pp. 545–740).

Vol. 4. Reports, etc., are presented on animal production, agricultural industries, and the women in the country on the following subjects: How to Utilize Heredity and Individual Selection for the Improvement of the Economic Production of Animals—Status and Results, by G. K. Constantinesco et al. (pp. 3–188); The Possibilities of Breeding Fur Animals as Agricultural Side Lines, by A. Fjelstad et al. (pp. 189–256); Management and Production of Ponds, by F. Fischer et al. (pp. 257–348); communications on animal production (pp. 349–426); Methods and Importance of Industrial Use and the Conservation of Potatoes and Legumes in View of Marketing Regulations, by B. Walukiewicz, J. Rietsema, et al. (pp. 445–551); communications on agricultural industries (pp. 553–567); Woman's Mission in the Struggle Against Migration from the Country, by M. Hainisch et al. (pp. 585–683); Proper Feeding of Rural Families with Products of Their Own Land, by H. Auerbach et al. (pp. 685–727); and communications on the women in the country (pp. 729–752).

[Papers presented at the twenty-fourth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 16 (1934), No. 1, pp. 1–135*).—Included are the following papers and discussions thereon presented at the meeting held at Philadelphia, December 27–29, 1933: The Farmer and Social Discipline, by H. A. Wallace (pp. 1–12); A Long Range View of National Agricultural Policy, by B. H. Hibbard (pp. 13–29); The Program of the Farm Credit Administration, by W. I. Myers (pp. 30–44); Some Policy Problems in a Federal Farm Credit Program, by M. R. Benedict (pp. 45–54); The Place of Government in a National Land Program, by R. G. Tugwell (pp. 55–72); The Place of Subsistence Homesteads in Our National Economy, by M. L. Wilson (pp. 73–87); The Program of Agricultural Adjustment, by C. C. Davis (pp. 88–98); Marketing Agreements under the Agricultural Adjustment Administration, by J. W. Tapp and E. W. Braun (pp. 99–114); Review of Current Farm Taxation Research, by M. M. Daugherty (pp. 115–118); Problems for Research in Public Finance Arising from Land-Use Zoning Programs, by G. S. Wehrwein (pp. 119–129); and The Need for Public Finance Research in Submarginal Areas in New England, by G. B. Clarke (pp. 130–135).

[Investigations in agricultural economics] (*Jour. Farm Econ., 16 (1934), No. 1, pp. 136–151*).—Notes are included on the following investigations and subjects: Grades of Wheat Purchased from Farmers' Cooperative Grain Elevators in Oklahoma, by R. A. Ballinger (pp. 136–138); A Comparison of Statistical Time Series for Butter Production and Market Receipts, by G. W. Sprague (pp. 138–142); Problems in Studying Local Prices of Farm Products, by L. F. Garey (pp. 143–145); Hog Prices and Election Years, by F. L. Parsons (pp. 145–149); and The New German Inheritance Law for Agriculture (Erbhofgesetz), by L. Drescher (pp. 149–151).

[Investigations in agricultural economics at the Indiana Station, 1932–33] (*Indiana Sta. Rpt. 1933, pp. 29, 30, 31, 39, 41, fig. 1*).—Results of

investigations not previously noted are reported on the combined harvester-thresher as to acreage harvested per machine and the costs in 1932 and 1931; effect on profits in northwestern Indiana of farm management practices; renters' opinions of farm tenancy methods; tax delinquency in southern Indiana from 1900 to 1932; soil type as a factor in economic land use of permanent pastures in Lawrence County; grading and marketing tomatoes, apples, sweetpotatoes, strawberries, and onions; and cooperative shipping of eggs.

[Investigations in agricultural economics at the New Mexico Station, 1932–33] (*New Mexico Sta. Rpt. 1933, pp. 12, 13, 16, 17*).—Results of investigations not previously noted are reported as follows on the cost of producing and marketing in New Mexico in 1932 apples, potatoes, sweetpotatoes, onions, and tomatoes on 3,038 acres in 14 irrigated and 2 dry-farm mountain areas; the relation between clay content and organic content of soils and the yield of potatoes; and the market qualities of New Mexico eggs shipped by parcel post, express, truck, and refrigerator freight.

Proceedings of the World's Grain Exhibition and Conference, Regina, Canada, 1933 (*Ottawa: Canad. Soc. Tech. Agr., 1933, vol. 1, pp. 479, [pls. 9, figs. 178]*).—Included are papers with discussions on the following subjects, read at the Conference held at Regina, Sask., Canada, July 24 to August 5, 1933:

I. The Present World Wheat Situation and Trends: Causes of the Agricultural Depression, by A. B. Genung (pp. 97–101); Wheat and the World Depression, by J. S. Davis (pp. 101–107); Present World Wheat Situation and Prospects, by W. S. Evans (pp. 107–119); and Trends in World Wheat Acreage, by T. W. Grindley (pp. 119–132).

II. World's Import Cereal Requirements: Wheat Consumption During the Depression, by C. L. Alsberg (pp. 134–147); World's Import Cereal Requirements, by A. Humphries (pp. 147–152); and World Wheat Supplies—An Importer's View, by G. J. S. Broomhall (pp. 152–156).

III. Governmental Regulation of the Wheat Industry: Autarchy and Free World Grain Production, by P. Kvakan (pp. 159–161); Maladjustment and Adjustment in Modern Farming, by H. D. Leppan (pp. 161–165); The New Era in Agriculture, by C. W. Peterson (pp. 165–173); and Agriculture and the State, by B. W. Snow (pp. 173–181).

IV. Merchandising Methods in Wheat Marketing: Operation of Country Elevators, by C. E. Hayles (pp. 186–192); Grain Merchandising Functions of the Elevator Systems of Western Canada, by H. L. Griffin (pp. 192–198); Co-operative Development in Grain Marketing, by L. C. Brouillette (pp. 199–207); The Disposal of Wheat, by A. H. Hobley (pp. 209–213); The Place of Co-operatives in Grain Marketing, by L. Hutchinson (pp. 213–216); and The Place of the Grain Exchange in World's Wheat Market, by A. E. Darby (pp. 217–222).

V. Financing Export Grains: Are Changes in Finance Needed? by W. W. Swanson (pp. 227–233); Financing the Canadian Grain Crops, by R. A. Rumsey (pp. 233–240); and Forecasting of Future Prices in Wheat Marketing, by J. R. Pickell (pp. 241–243).

VI. Transportation and Storage of Export Grains: Water Carriers and the Grain Trade, by F. C. Cornell (pp. 249–255); and Transportation and Storage of Export Grains, by S. T. Smith (pp. 255–259).

VII. Economic and Social Aspects of World Wheat Production: The Wheat Problem of Russia, by V. P. Timoshenko (pp. 262–271); Practical Wheat Farming in British India, by G. S. Henderson (pp. 272–276); A Brief Note on Wheat Production in the Punjab, by H. R. Stewart and K. Singh (pp. 276–280); Australian Activities in Connection with the Wheat Industry, by

F. H. Stewart (pp. 280–288); Wheat Industry in Australia, by C. W. Walker (pp. 288–294); Economic Status of Wheat Production in Western Canada, by W. Allen (pp. 294–302); Farm Tenancy in Western Canada, by A. Stewart (pp. 303–307); and The Work of the Canadian Pioneer Problems Committee, by R. W. Murchie (pp. 307–312).

VIII. Marketing Grains Through the Livestock Route: Marketing Grains Through the Livestock Route, by A. M. Shaw (pp. 313–315); Marketing Grains Through Dairy Cattle, by W. H. Hicks (pp. 316–319); Marketing Grains Through Beef Cattle, by J. P. Sackville (pp. 319–322); Marketing Grains Through Swine, by C. M. Learmonth (pp. 322–325); Marketing Grains Through Sheep and Lambs, by A. A. MacMillan (pp. 325–329); and Marketing Grains Through Poultry, by F. C. Elford (pp. 329–335).

IX. Economic and Social Aspects of Mechanization of Grain Production: An Agricultural Engineer Looks at Mechanized Farming in Russia, by E. J. Stirniman (pp. 336–350); Future Developments in Wheat Growing, by J. Newman (pp. 350–352); Some Economic Effects of Mechanization of Canadian Agriculture with Particular Reference to the Spring Wheat Area, by J. F. Booth (pp. 352–361); and The Real Effects of Mechanization on Wheat Production, by L. J. Fletcher (pp. 361–368).

[Farm economics in Great Britain] (*Farm Econ.* [*Oxford Univ.*], *1* (*1934*), *No. 5, pp. 89–100, figs. 2*).—Included are the following articles: Land Improvement by Marling in Yorkshire, by A. G. Ruston (pp. 89–91); Small Holdings in Oxfordshire, by A. H. A. Wynn (pp. 91, 92); Changes of Occupiers on Mid-Devon Farms, 1912–1932, by J. J. MacGregor (pp. 92, 93); The Marketing of Certified Milk, by J. Stewart (p. 94); Forecast of the Wheat Acreage in 1934, by R. McG. Carslaw (pp. 95, 96); and Egg Supplies and Prices, by K. A. H. Murray and R. L. Cohen (pp. 97–100)

Agriculture in the evolution of the world crisis (*L'Agriculture dans l'évolution de la crise mondiale.* [*Paris*]: *Inst. Natl. Agron.*, *1933*, *pp. 233+*[*1*]).—Included are an introduction by H. Queuille and the following papers presented at six conferences organized by the National Institute of Agronomy, held from February 1 to April 5, 1933: Agriculture and the Crisis in the United States, by L. Romier (pp. 27–48): German Agriculture and the Economic and Financial Policies of the Country, by D. Serruys (pp. 53–73); The Crisis in Central Europe from the Viewpoint of Agriculture, by J. de Nicolaÿ (pp. 81–101); The Agricultural Situation in South America, by J. H. Ricard (pp. 109–157); The Agricultural Debts of Japan, China, and the Indies: Their Effects upon the Crises—Political and Economic, by P. Lyautey (pp. 169–191); and The Great Lessons of the Crisis and French Agriculture, by W. Oualid (pp. 201–233).

The introduction of farm machinery in its relation to the productivity of labor in the agriculture of the United States during the nineteenth century, L. Rogin (*Calif. Univ. Pubs. Econ.*, *9* (*1931*), *pp. IX+260, figs. 84*).—Part 1 deals with the plow, harrow and field cultivator, and part 2 with wheat harvesting, threshing, and seeding machinery. The introduction and improvement of each type of implement or machine are described, and the effect of each on labor requirement is discussed.

Land settlement as a relief measure, R. W. Murchie (*Minn. Univ., Day and Hour Ser. No. 5* (*1933*), *pp. 32*).—Some of the early "back to the land" experiments in the United States and some recent proposals and experiments in Canada and the United States are described. The types of land settlement plans and the limitations of the back to the land movement as a solution for unemployment are discussed.

Recent developments in subsistence-homesteads movement (*U.S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 38 (1934), No. 2, pp. 245–253*).—The Federal subsistence-homesteads policies, progress made, types of families chosen, types of communities planned, sources of employment for homesteaders, cooperative agencies, and some of the results obtained are described and briefly discussed.

Short-term credit used by 131 Ohio farmers, J. H. Sitterley (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 67 (1933), pp. 7*).—Data obtained during the fall of 1933 in six representative sections of Ohio are analyzed to show as of September 1, 1933, the average amount of short-term credit, sources of such credit, amount over one year old, new credit obtained during the previous year, its sources and monthly distribution of notes given, types of security, and purpose or use of credit.

Types of farming in the Eastern Connecticut Highland, I. G. Davis (*[Connecticut] Storrs Sta. Bul. 191 (1933), pp. 80, figs. 13*).—The objectives of this study, made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., were "(1) to find a method of classification for the farms of the Eastern Connecticut Highland and (2) to classify the farms, to count and describe them in the several classes, and to determine the degree of variation or dispersion appearing in each of the several classes."

Different measures of size of enterprise for use in classifying the farms are discussed. The 2,127 farms in the area are classified as residence farms (having a total of 50 or less productive man work units and produce the farm products which are, with few exceptions, consumed entirely in the home), commercial part-time farms (having a total of 51 to 149 man work units), and commercial farms (having a total of 150 or more man work units). Each class is subdivided into 5 to 10 subclasses.

The types are described with tables and charts showing the frequency distribution of tillable acres, number of cows and hens, acreage in vegetables, cords of wood cut, and months of outside labor, the mean, mode, and percentage of all cases in various intervals, by subclasses, on the basis of type of outside labor, and the mean age of operators and percentage of farms in various age groups by outside labor subclasses for the residence and commercial part-time farms; data as to land utilization, number of dairy stock and poultry, acreage of vegetables, man work units, months of labor off farms, milk produced, etc., on less than 1-, 1½-, 2-, 2½-, and 3-man wholesale dairy farms, on retail dairy farms, and on 1- and 1½-man specialized poultry farms; the mode, mean, and dispersion of tillable acres, number of cows, number of other dairy stock, cords of wood cut, average quarts of milk per day, acres of silage, and age of operators on the specialized wholesale dairy farms; the frequency distribution of tillable acres, number of cows and other young stock, average daily quarts of milk, family labor, and hired labor on 1½- and 2-man wholesale and 1-man retail dairy farms; the mean, mode, and percentage of all farms in various intervals of tillable acres, number of hens, and number of chicks for 1- and 1½-man poultry farms; and similar frequency distribution on vegetable, apple, and combination farms of different types.

The influence of historical background, soils, location of farm, and size of farm on type of farm are discussed, and correlation analysis is made of the effect of the several factors.

Significant positive associations were found between dairy farming and Charlton and Taugwank soils and larger farms, between retail dairy farming and zones of direct urban influence, poultry and residence farms and small farms, deserted farms and the Gloucester and Brookfield soil series, dairy-

combination farms and Chariton and Taugwank soils, part-time and residence farming with industrial and commercial outside labor and zones of direct urban influence, vegetable farms and zones of direct urban influence, and vegetable farming and the Merrimac soil type.

The place of field crop production in New Jersey, H. B. Sprague (*New Jersey Stas. Circ. 294 (1934), pp. 14*).—Information is included as to acreages in New Jersey in different crops and the value of the crops in 1929; prices of feed crops, 1925–29; production and demand for feed crops in the State; relative costs of producing feeds in the East and in the West; and the feed costs in milk production and in the poultry industry.

"Unless more important factors can be found than acre yields, land values, labor costs, and fertilizer consumption, the conclusion must be accepted that high costs of crop production, wherever they actually exist in New Jersey, are the result of inefficient farming practices. There appears to be no fundamental reason why feed crops of the types required by the livestock industry cannot be produced in New Jersey at costs comparable with those of the surplus feed producing States, or at least, considerably less than the price of feeds purchased in the open market in the East. . . . It seems clear that the production of field crops in New Jersey should continue to play the fundamentally important role of supplying feed at reasonable cost for the livestock industries."

[Investigations in farm management in Michigan] (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 148–160, fig. 1*).—Two articles are noted.

Costs of producing pullets in 1933, P. F. Aylesworth (pp. 148–153).—Tables show, by items, the charges per farm, per pound of poultry, and per pullet, the credits per farm, and other data for 93 farms and for the 15 low-cost and 15 high-cost farms. The factors affecting costs and returns are discussed briefly. Comparison is made of the charges and costs per pound of poultry on farms studied in 1931, 1932, and 1933. A table shows the cost per pound of poultry and the net cost per pullet on the farms grouped according to whether they were above the average in one or more of the following factors: (1) Less than 15.1 percent mortality, (2) less than 31 hours labor per 100 chicks, (3) less than 4.8 lb. of feed per pound of poultry, (4) less than 15.2 ct. total cost per pound of poultry, and (5) more than $9.83 broiler income per 100 chicks.

Egg production costs and returns in Michigan, K. T. Wright (pp. 154–160).—Records of egg production and sales, feed fed, and other expenses from 70 poultrymen in four sections of the State are analyzed. Tables show, by items, the average charges and costs per hen and per dozen eggs for all flocks and for the 14 low- and high-cost flocks; the relation of egg production per hen and season of egg production to costs and returns; the combined costs and returns, by items, of young and mature poultry on 40 farms November 1, 1932, to October 31, 1933; and the eggs laid per hen, total cost per hen, cost of eggs per dozen, and profit per hen where poultry were better than the average in one or more of the following factors: (1) Eggs laid per hen (157), (2) eggs per hen from November 1 to February 1 (28), (3) mortality (19 percent), (4) pounds of feed per dozen eggs (5.9), and (5) cost per dozen (15.6 ct.).

[Variations in production costs and earnings on Michigan farms], E. B. Hill (*Michigan Sta. Rpt. 1933, pp. 238–241*).—Tables show the average costs of production, 1932, for potatoes, beans, pullets, eggs, and butterfat for all farms and for the 10 low- and 10 high-cost producers, and for 1931 the average operator's income, rate earned on investment, cash receipts, and cash expenses for all farms and the high and low one thirds, the farms being grouped by size.

Farm organization practices and costs of producing crops in the Middle Rio Grande Conservancy District of New Mexico, A. L. Walker and P. W. Cockerill (*New Mexico Sta. Bul. 215 (1933), pp. 71, figs. 11*).—This report covers the years 1929 to 1931, inclusive, and shows the conditions before reclamation by drainage and flood control on 99 (53 general, 19 dairy, 9 vegetable, 6 poultry, and 12 fruit) of the best located farms in the district. Business summaries show for each type of farm for each year and the averages for the three years, by items, the credits and charges, farm and labor incomes, and returns on investment and for management. Analysis is made for each type of farm of the factors affecting costs of production and earnings, and of cash expenditures for and value of living furnished by the farms.

For the general farms the farm income and average returns for management were $66 and —$795, being $167 and —$741 for the farms with a crop index from 106 to 238, and —$35 and —$849 for those with a crop index from 32 to 105. The income and returns were $266 and —$772, respectively, for the farms with a labor efficiency index of 91.1 to 201.8, and —$94 and —$818, respectively, for those with indexes of 45.7 to 91. They were $170 and —$704, respectively, when livestock credits per animal unit were $67 to $388 and —$38 and —$886 when the credits were zero to $66; they were —$27 and —$934 on the farms with 3.8 to 157.4 animal units, and $159 and —$656, respectively, on those with zero to 3.7 animal units. The average farm incomes with different combinations of enterprises are shown in tables, and the monthly labor requirements for wheat, corn, and alfalfa in charts.

On the dairy farms the average milk production per cow was 6,107 lb. and the average management returns $531. On farms with average milk production per cow over 7,000 lb. the management return was $1,779, as compared with —$15 and —$91 for the farms with average milk production per cow of 5,000 to 7,000 lb., and under 5,000 lb., respectively. Where the crop acreage per cow was over 0.81 acre, the return was $878; where it was less than 0.81 acre, $278. Where only 25 percent or less of the milk tests showed more than 10,000 bacteria per cubic centimeter, the return averaged $1,827 as compared with $966 and —$97, respectively, where 26 to 50 percent of the tests and over 50 percent of the tests showed more than 10,000 bacteria. The farms with 1, 2, 3, 4, 5, or 8 of the following favorable factors—milk production above average, crop acres per cow above average with above average yields per acre, labor used and feed bought below average, quality of milk above average, use of silo, use of pasture per cow above average, number of young stock above average, investment in land below average—had the following average management returns, respectively, —$3,805, —$528, $377, $1,206, $951, and $3,835.

The average farm income per acre and average management return per farm on the vegetable farms were $60 and —$123, respectively, being $109 and $1,000 on those with crop sales per acre above the average, and $15 and —$1,024 for those with crop sales below the average. The management returns averaged $821 for the farms with labor expenses per $100 of crop sales below the average, and —$880 for those with expenses above the average. The average management returns when none to 7 of the following favorable factors were present—gross income above average, number of products sold above average, labor expense per $100 of sales below average, car and truck expense below average, double-cropping above average, manure and fertilizer purchases above average, distance to market below average—were —$1,404, —$889, —$711, —$461, and +$1,621, respectively. A chart shows the monthly labor requirements for late cabbage, tomatoes, and early onions; and a table, the per-acre labor requirements and costs for each of the vegetable crops.

Fruit farms with management returns above the average had 36 percent of crop acreage in apples and 35 percent in other fruits, as compared with 50 percent and 15 percent, respectively, for those with returns below the average. A chart shows the monthly labor requirements for apples, grapes, and cantaloups; and a table, the per-acre labor requirements and costs of producing apples and grapes.

On the poultry farms the average farm income and management returns were $340 and —$450, respectively, being $550 and —$349 where the flocks were above the average in size, and $127 and —$555 where they were below the average. The average net cost per hen was $3.78, and the cost of eggs per dozen 33 ct. The costs with a large flock (950 birds) were $3.73 and 31 ct., respectively, and with a small flock (260 birds) $5.06 and 42 ct., respectively.

The average cash expenditures for family living on the different types of farms were: General $459, dairy $1,448, vegetable $976, fruit $689, and poultry $686. The average values of the living furnished by the farms were: General farms $350, dairy farms $577, vegetable farms $355, fruit farms $330, and poultry farms $172.

Economic aspects of the bee industry, E. C. Voorhies, F. E. Todd, and J. K. Galbraith (*California Sta. Bul. 555 (1933), pp. 117, figs. 29*).—This bulletin reports the results of an investigation in cooperation with the U.S.D.A. Bureau of Entomology. It describes and discusses the development and geographic distribution of beekeeping, floral sources of honey (including a check list of scientific names), types and forms of honey, grades and grading, honey production and consumption, beeswax production and prices, queen-bee and package-bee production, and the domestic trade in the United States; the world honey situation; and, for California, the bee ranges and their distribution, the distribution of beekeeping, honey production, prices and purchasing power, and the factors affecting prices, queen- and package-bee production, and the foreign exports and their future status.

Grade, staple, and variety of Mississippi cotton: Crops of 1928–1932, L. E. Long (*Mississippi Sta. Bul. 300 (1933), pp. 32, figs. 5*).—Tables, charts, and maps show (1) the average ginnings in the State, 1928–32, by counties, (2) the number of bales of different staple lengths ginned in the United States and Mississippi each year from 1928 to 1932, inclusive, and (3) by counties, for each year from 1928 to 1932, inclusive, the production of Middling White and better cotton, and different staple lengths and varieties of cotton.

Grade and staple length of cotton carried over in the United States as related to the domestic supply, 1928–29 to 1931–32, W. B. Lanham and O. T. Weaver (*U.S. Dept. Agr., Statis. Bul. 45 (1934), pp. 23, figs. 9*).—Tables and charts are included and discussed showing the relationship of carry-over and supply; the average staple length of crop, carry-over, and supply; the proportion of the total supply of each staple length carried over; the disappearance of the various staple lengths into domestic consumption and exports; tenderability of cotton in the carry-over; the grade of the carry-over as compared with that of the supply; and the carry-overs of American-Egyptian cotton and of Egyptian and other foreign cotton.

The proportion of the supply carried over is very much larger for the longer staple than for the shorter staple cotton. The average staple length of the carry-over is consistently greater than that of both the previous crop and the supply of which the carry-over is a remainder. The carry-over does not include large quantities of "unspinnable" or untenderable cotton. Despite the decrease of the supply shorter than ⅞ in. and longer than 1⅛ in., the proportion of the carry-over of these lengths has increased in very much the same proportion

as has the supply of the lengths of ⅞-in. to 1$\frac{1}{16}$-in. cotton. Domestic consumption and exports have taken from the supply each year an increasingly greater proportion of the medium staple lengths. The carry-over stored in consuming establishments on August 1 each year contained a larger proportion of the longer cotton than that stored outside such establishments. The proportion of the supply of the lower grades carried over has been larger than that of the supply of the higher grades carried over.

Decreases in the production and use of American-Egyptian cotton have been confined almost entirely to the staple lengths 1½ and 1$\frac{9}{16}$ in. Much larger proportions of the imports of Sakellarides cotton have been carried over than of Egyptian cottons of shorter staple length.

Inspection of United States wheat exported through Canadian ports (*U.S. Dept. Agr., Misc. Pub. 187 (1934), pp. 20*).—This publication, prepared by the Bureau of Agricultural Economics, describes the extent of the export of United States wheat through Canadian ports, compares the grain standards and inspection of the two countries, discusses the procedure at eastern Canadian ports and its effects on the exportation of United States wheat, and suggests methods for improving the standards of inspection.

Bread grain consumption and trade in Scandinavian countries, J. H. SHOLLENBERGER (*U.S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., F.S. 60 (1933), pp. 34*).—Tables are included and discussed, showing the production, consumption requirements, characteristics and quality, milling practices and regulations, baking practices, and dietary habits in Sweden, Norway, and Denmark.

Control of the price of rice, S. TOBATA (*Tokyo: Inst. Pacific Relat., 1933, pp. [2]+53*).—The economic features of the rice industry are described, and a short history is given of rice price control in Japan. Some suggestions for further study of the problem are included.

Prices and consumption of milk in specific cities as related to industrial payrolls and other economic factors, R. W. BARTLETT (*Illinois Sta. Circ. 418 (1934), pp. 36, figs. 25*).—This circular gives the general reader the essential facts of Bulletin 397, previously noted (E.S.R., 70, p. 858).

An experiment in packing Ohio apples, C. W. HAUCK (*[Ohio State Univ.,] Dept. Rural Econ. [Mimeogr. Bul.] 68 (1933), pp. 9*).—U.S. No. 1 Red Delicious apples were packed in 7 types of containers—wooden boxes (northwest type, western and southern shooks); paperboard boxes (western style, cell pack 120's, cell pack 96's, and 10 consumer cartons); and bushel baskets (tub type). The apples were retailed in the Columbus market.

Tables show for each type of container fruit sizes, weights and capacities of packages, storage displacement, hauling and storage rates, package and packing costs, condition of fruit after storage, prices received, and gross returns less packing costs per pound of fruit.

[Agricultural marketing schemes, Scotland] (*London: Min. Agr. and Fisheries, 1933, pp. 19*).—This is the first report by the Minister of Agriculture and Fisheries of Great Britain and the Secretary of State for Scotland on the operation of all schemes in force under section 10 of the Agricultural Marketing Act, 1931.

Crops and Markets, [March 1934] (*U.S. Dept. Agr., Crops and Markets, 11 (1934), No. 3, pp. 73–104, figs. 3*).—Included are tables, charts, reports, and summaries of the usual types, and tables showing, by States, the acreages of different crops harvested in 1932 and 1933 and the indicated acreage (March 1) for 1934.

The first world agricultural census: Irish Free State (*Internatl. Inst. Agr. [Rome], First World Agr. Census Bul. 1 (1932), pp. 37*).—This is the first

of a series of bulletins giving results of the world agricultural census taken by the International Institute of Agriculture in 1929–30.

Data are included as to area, number and size of holdings, tenure, land utilization, agricultural machines and implements, livestock, poultry, bees, livestock products, persons engaged in farm work, wages of hired labor, etc., both totals and for the farms grouped by the size of holding.

The first world agricultural census: Estonia [trans. title] (*Inst. Internatl. Agr.* [*Roma*], *Premier Recense. Agr. Mondial Bul. 2* (*1931*), *pp. 63*).—This bulletin of the series noted above gives the data in totals and for the farms grouped by size and by tenure. It is published in French.

RURAL SOCIOLOGY

The relationship of the open-country population of Genesee County, New York, to villages and cities, E. A. Taylor ([*New York*] *Cornell Sta. Bul. 583* (*1934*), *pp. 59, figs. 13*).—Approximately 85 percent of all open-country families in Genesee County were studied to determine their economic and social relationships with villages and cities. While the open-country population has remained relatively constant from 1900 to 1930, many changes have taken place in the villages and cities, the most important being the decline in the number of business concerns and manufacturing plants in the smaller centers, the addition of many new types of businesses in the larger centers, and the rise of business establishments in the open country to serve the growing tourist trade.

Of the 2,940 open-country families studied, 57 percent bought most of their groceries at independent stores and traveled approximately 3.8 miles for them, while 43 percent patronized chain stores and resided about 5.8 miles from them.

The percentage of families who purchased hardware in the villages was 48.8, in the small city it was 37.3, and in the metropolitan centers it was 3.5, and the average number of miles to all centers for hardware purchases was 5.6. Banking areas are larger than hardware areas and not so numerous. Of all the families who do banking, 38.4 percent banked in the city of Batavia. Coal and ice were usually purchased locally, and feed also was purchased nearby. Close similarity existed between the coal-and-ice, the feed, and the railroad-station areas. One third of the open-country families reported no sales of farm products. Large quantities of milk and farm produce are not taken to the centers, but are disposed of upon the farm. The open-country families of Genesee County dispose of their farm products in the smaller centers to a much larger extent than they buy their consumption goods in these centers.

A considerable number of the families included in the study obtained none of the social services listed. Church attendance (one member attending at least once in two months) was reported by 63.8 percent of the families, 16.5 percent had children in high school, 33.8 percent reported grange members, 20.1 percent lodge members, 18.0 percent farm-bureau members, 4.5 percent home-bureau members, and 35.9 percent reported motion-picture patronage. The leading social organization in the county is the grange, with 990 open-country families reporting membership. Only 11.5 percent attended grange in other than the local grange area in which they resided.

The areas constructed upon the basis of the village visited the most frequently by the open-country families represent approximately the community areas. Within these areas 84 percent of all families visited the local village more than any other. The larger centers have better defined social and economic areas than the smaller ones. Small centers (less than 1,000 inhabitants)

are holding their social relationships with the surrounding open-country families to a much greater degree than is true for the economic relationships. Families residing near a large village make fewer city contacts than those residing near a small village. A close relationship exists between the distance from the center and the number of contacts with that center.

Relation of cities and larger villages to changes in rural trade and social areas in Wayne County, New York, H. C. Hoffsommer (*[New York] Cornell Sta. Bul. 582 (1934), pp. 61, figs. 22*).—This is one of a series of studies dealing with the social and economic areas of counties in central New York (E.S.R., 65, p. 786; 66, p. 888; 70, p. 414).

Cities are not seriously affecting the larger villages except in a few specialized lines. The villages lose trade to the cities mainly through their inability to handle elaborate lines of merchandise rather than from their inability to handle a variety of lines.

Wayne County farmers partake only passively (motion pictures, lectures, etc.) in the social life of the city. Villages of 500 population and less have suffered severely from the competition of the larger villages. The smaller villages have maintained their status better socially than economically.

The percentage of open-country families who obtain their various services in the local area centers decreases generally with the decrease in population of the center under consideration. The larger the village the greater the territory included in the various service areas and the greater the number of inhabitants per unit of service. The average distance traveled for the various services is farthest for the purchase of women's dresses and shortest for church attendance. The greatest distances traveled are for economic services and the shortest distances for social services. The number of families within the frequency area of the village varies directly with the size of the village. Nearly 90 percent of the families go more frequently to their local frequency center than to an outside center, a fact indicative of strong locality influence. The small village is declining as a business center.

The data show that social life at present is carried on in relatively small areas. A trend toward the uniting of small social areas into larger ones is evident, but the expansion of the social areas has been much less marked than that of the commercial areas. This leads to the conclusion that although churches, schools, and other social and educational agencies may unite for better and more effective work, the areas which they can effectively serve will remain relatively small as compared to those of the more specialized economic services.

[Adjustments by farm families during the depression], E. Mumford (*Michigan Sta. Rpt. 1933, pp. 248, 249*).—Adjustments made by 112 farm families are briefly noted.

FOODS—HUMAN NUTRITION

The chemical composition of certain foods, J. S. Hepburn, N. A. Fegley, K. S. Sohn, J. R. Cox, E. A. Read, and R. F. Wallace (*Amer. Jour. Pharm., 105 (1933), No. 11, pp. 547–550*).—Proximate analyses by the Official method and calculated calorie values are reported for several foods and food products as follows: Apple butter, dried ale yeast, prepared cereals (derived primarily from rice, wheat, and wheat and barley), cashew nut kernels (raw, fried, and fried and salted), a special "diabetic" bread (prepared from casein, palm-nut flour, and eggs), "gefüllter Fisch", pidan or Chinese preserved egg, pineapple slices and sirup (canned without sugar), cooked prunes (pulp and juice), red banana, and soybean milk.

Directions for submitting food samples for bacteriological analysis, E. D. Devereux and C. S. Bryan (*Michigan Sta. Quart. Bul., 16 (1934), No. 3, pp. 146–148*).—Explicit directions are given for procuring and shipping to the laboratory samples or specimens of milk, milk products, and foods for quantitative examination for saprophytic (nonpathogenic) organisms, and qualitative examination for organisms causing a ropy condition or abnormal flavors, odors, and appearance. Special directions are also given for the collection and shipment of milk to be examined for the presence of organisms causing mastitis and for abortus organisms that may infect the udder.

Cereal foods, their advertising, and the committee on foods of the American Medical Association, R. Hertwig (*Cereal Chem., 11 (1934), No. 1, pp. 74–80*).—The work of the committee on foods of the American Medical Association is discussed as it affects cereal foods and their advertising, including the conditions under which any cereal food is accepted by the committee, types of advertising considered inappropriate, and general committee decisions on the ideal label for foods and on good food advertising.

The standard baking test under English conditions, D. W. Kent-Jones (*Cereal Chem., 11 (1934), No. 1, pp. 57–65*).—This is a report and discussion of results obtained in applying the standard baking test of the American Association of Cereal Chemists (E.S.R., 69, p. 591) to European conditions. In the author's opinion the standard test, relying largely upon loaf volume, is not useful in evaluating the baking properties of the various types of commercial flours encountered in England. The suggestion is given that progress is most likely to be made by a more thorough study of the physical properties of doughs.

Some comments on the paper by Kent-Jones entitled "The Standard Baking Test under English Conditions", W. F. Geddes, R. K. Larmour, and C. E. Mangels (*Cereal Chem., 11 (1934), No. 1, pp. 66–69*).—In this reply to the paper noted above, attention is called particularly to the suggestion that the various factors contributing to baking qualities might be more satisfactorily evaluated by mechanical measurements of doughs. It is noted that although physical, physiochemical, and chemical factors have long been studied, it has been found impossible to replace the baking tests by quantitative measurements of these factors, for in the last analysis such measurements have to be interpreted in terms of baking behavior. "The very fact that baking behavior is a conglomerate of a number of factors would seem to render it very difficult, if not impossible, to predict with precision the baking characteristics of a flour from a series of quantitative values which may vary independently. While the baking test has many drawbacks, it must remain until our knowledge of cereal chemistry greatly increases; for maximum utility, the procedure and interpretation should be standardized."

The laboratory baking test—a science or a fine art? M. J. Blish (*Cereal Chem., 11 (1934), No. 1, pp. 70–73*).—This paper meets several of the criticisms expressed by Kent-Jones of the standard baking test, as noted above, and emphasizes particularly the fact that the basic procedure was established as the common reference point, and that any supplementary method may be used without violating the purpose and intent of the standard test.

Destroying mold spores on bread by ultra-violet radiation, J. W. Read (*Cereal Chem., 11 (1934), No. 1, pp. 80–85*).—Freshly baked bread heavily infected with the mature spores of the more common species of *Aspergillus*, *Penicillium*, *Rhizopus*, and *Mucor* was subjected for varying lengths of time at a given distance to ultraviolet radiations from three types of mercury vapor lamps and from the open C_4 type of carbon lamp with carbons of different materials in the core.

The carbon lamp gave better results than the mercury vapor lamp, and there was considerable variation in the effectiveness of the different carbons. The most effective destroyed heavy spore infection on the surface of the loaves in 45 sec. at a distance of 8 in., with the lamp operated by the direct current at 75 a and 60 v. Wrapping the infected loaves in transparent sheeting such as cellophane and Sylphwrap did not decrease the fungicidal potency of the radiation. This process of sterilization is being used on a limited commercial scale to prevent the occurrence of mold on certain special breads.

[Factors affecting the palatability of the New Mexico pinto bean] (*New Mexico Sta. Rpt. 1933, p. 50*).—This progress report includes a brief discussion of preferences and prejudices in methods of cooking beans in the Southwest.

A study of the iodine content of Pennsylvania potatoes, D. E. H. FREAR (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 2, pp. 171–182, figs. 4*).—After considering various methods of determining iodine, the closed combustion method of Karns (E.S.R., 68, p. 587) was adopted in principle in these studies from the Pennsylvania Institute of Animal Nutrition, but modified to obviate the use of solid carbon dioxide and to lessen the cost and time required. The modified apparatus is described and illustrated. The absorption vessels employed are adaptations of a suggestion of Baumann and Metzger. In commenting upon the method, attention is called to the fact that at no point subsequent to the combustion which takes place in a closed system, thereby preventing loss of iodine, were the products containing iodine exposed to a temperature much higher than 318° C., and that exposure to this temperature never occurred except in the presence of a considerable excess of NaOH, which would prevent the volatilization of iodine compounds.

Expressed on a moisture-free basis, the minimum, maximum, and mean values for the entire number of samples were 10, 216, and 77.8 parts of iodine per billion, respectively. In considering the effect of geographical distribution, the State of Pennsylvania was divided arbitrarily into six sections of approximately the same size, and comparisons were made of the iodine values of the samples from the different sections. The mean iodine value of the potatoes grown in the southeastern section of the State was found to be significantly higher than that of the samples grown in the north central section, but no other sectional differences were noted.

When the samples were divided into five groups according to different soil types, it was found that those grown on glaciated soils contained slightly more iodine than those grown on similar nonglaciated soils. The only significant differences, however, were in two samples grown on marine soil, these having a much higher iodine content than the other samples. No significant correlation was found between the iodine content of the potatoes and the type of fertilizer, size of individual potatoes, or variety.

Records of physical examinations of 6,354 students at the Pennsylvania State College during the past five years showed a goiter incidence of 2.9 percent. From several other surveys made under the auspices of the Pennsylvania Department of Health, the state-wide incidence of goiter was estimated to be 2.3 percent. A total of 29 cases of goiter was reported in 24 of the 135 farm families supplying the potatoes for this study, or an incidence of 4.3 percent. Six cases of thyroid derangement among livestock were also reported from these farms.

"In consideration of the slight incidence of goiter in the State, and the uncertain significance of the iodine content of potatoes as indicative of the iodine content of the diet as a whole, no significant correlation was to be expected from this comparison, and none was found."

Fruit by-products, J. L. St. John, H. Gerritz, and R. F. Cohee (*Washington Sta. Bul. 291* (*1934*), *p. 25*).—This progress report announces the development of a process for manufacturing a satisfactory concentrated product from apples and other fruits and vegetables.

Studies in home canning methods (*Indiana Sta. Rpt. 1933, p. 37*).—This progress report deals chiefly with oven canning methods.

***Nutritional studies of foodstuffs used in the Puerto Rican dietary.*— IV, Extract of the annatto seed, Biax orellana: Its preparation and physiological properties,** D. H. Cook and J. H. Axtmayer (*Amer. Jour. Trop. Med., 14* (*1934*), *No. 1, pp. 61–75, figs. 5*).—This paper of the series noted previously (E.S.R., 68, p. 708; 70, p. 725) gives a more complete account of the discovery. noted from a preliminary report (E.S.R., 67, p. 481), of the vitamin A activity of the coloring matter surrounding the seeds of the annatto plant, and reports further studies on the active material.

The material separated from the seeds by extraction with cold alcohol proved to be more active than the hot alcohol extract, the respective values being 430 and 350 units per gram of dissolved solids. The greater activity of the extract prepared in the cold is attributed to the decreased solubility in the cold alcohol of inactive material, chiefly bixin. The oil obtained by extraction with petroleum ether, in which bixin is insoluble, had a vitamin A activity of more than 1,000 units per gram.

Inasmuch as annatto seed is commonly used in Puerto Rico for coloring and flavoring foods by frying the seed in a little lard or other edible fat which extracts the coloring matter and using small quantities of the colored fat as a seasoning or coloring agent, vitamin A determinations were made on Crisco, 100 g of which had been heated at 150°–160° C. for 5 min. with 25 g of annatto seed. The group of rats most nearly approaching unit growth consumed the equivalent of 0.19 g of the Crisco extract per rat per day. From this it is estimated that from 47 to 50 mg of the seed furnishes about 1 unit of vitamin A.

Preliminary tests showed the presence of vitamin D in the petroleum ether extract of the seed. No difference could be detected between the activity of the extract and a similar extract which had been exposed to intense sunlight. It is thought that vitamin D is probably formed by the action of sunlight in the oily seed coating during drying.

The mechanics of the digestive tract, A. E. Barclay (*Lancet* [*London*], *1934, I, No. 1, pp. 11–15, pl. 1, figs.* [*5*]).—This paper, which is illustrated by radiograms, composite tracings from radiograms, and kymographic tracings, deals with the mechanics of digestion as seen by the radiologist. The wide divergences which exist between accepted descriptions of the progress of food through the alimentary tract and what is actually seen by the radiologist in the course of routine work are indicated by the author's summary.

"The normal mechanism of the propulsion of food through the alimentary tract can only be seen under normal conditions by radioscopic methods. Normal movements depend on the free mobility of the viscera. Under restricted conditions, or when the abdomen is opened, such movements as are seen are likely to be reserve mechanisms or distortions of natural movements. Nature adheres to no set form and may perform the same function in several ways. Radioscopic observations suggest that in the upper part of the tract peristalsis is a reserve mechanism. Under normal conditions the food is propelled mainly by other means, such as increased tonic action and movements of the mucous membrance, perhaps also aided in some parts of the tract by the development of negative pressures ahead of the oncoming food. In the lower tract there is no rhythmic peristalsis, but only occasional and infrequent projection of the contents through considerable lengths of intestine."

Calories and proteins (*Lancet* [*London*], *1934*, *I*, *No. 2*, *pp. 87*, *88*).—This editorial discusses certain discrepancies in the recommendations of the nutrition committee of the British Medical Association (E.S.R., 70, p. 718), and the earlier recommendations of a similar committee of the Ministry of Health under the chairmanship of M. Greenwood (E.S.R., 68, p. 125). The earlier report recommended 3,000 calories and 37 g of protein per man per day and the more recent report 3,400 calories and 50 g. It is noted that the earlier report conforms in calories to the international standard adopted at the League of Nations Conference (E.S.R., 70, p. 275).

Scientific feeding of children, L. J. Roberts (*Jour. Amer. Dental Assoc.*, *21* (*1934*), *No. 1*, *pp. 44–57*, *figs. 4*).—In this paper, presented at the 1933 meeting of the American Dental Association in conjunction with the Chicago Centennial Dental Congress, the author outlines the requirements for adequate nutrition in childhood according to present knowledge, and summarizes dietary studies on children, as reported in the literature, demonstrating that an improved dietary does bring about improved nutrition.

The food requirements of a preschool child are given in terms of quantities of essential food constituents and of servings of common foods. For the former, the quantities are 1,500 calories, 50 g of protein, 1 of calcium, 1.2 of phosphorus, and 0.0075 g of iron per day. Estimated vitamin requirements are vitamin A 3,000, vitamin C 15, and vitamin D 240 units. No requirements for vitamins B and G are proposed, but the typical foods selected in quantities necessary to provide the known essentials furnished 110 or more units of vitamin B and 650 of vitamin G.

In conclusion the author states that "instead of following blindly after every new diet fad that makes its appearance, we should accept rather some simple common-sense dietary made up of ordinary foods available in the community concerned, in such quantities as are recognized by authorities in nutrition to be adequate, and use it faithfully and regularly in the feeding of children. If we could but do this relatively simple task for the children under our guidance continuously throughout their development period, we should reap a rich reward in the way of a greatly improved generation of children and adults. It is safe to say, moreover, that this improvement would be especially marked in respect to the teeth."

School lunches, with recipes to serve 50 children (*U.S. Dept. Agr.*, *Bur. Home Econ.*, *1934*, *pp. 13*).—This mimeographed material has been prepared especially to meet the needs of relief agencies and other organizations intrusted with providing low-cost nourishing school lunches. Following a discussion of the types of food which should be served and general purchasing suggestions, menus are given for 15 lunches, with recipes and a list of the quantities of suitable foods required for the main dish to be served at each of these lunches.

Noon meals for nursery schools, H. N. Hann (*U.S. Dept. Agr.*, *Bur. Home Econ.*, *1934*, *pp. 14*).—This mimeographed material, based on work at the National Child Research Center in Washington, D.C., includes general suggestions on planning and preparing the noon meals customarily served to nursery schools, with menus for two weeks and recipes for the main dishes in quantities ample for a group of 25 children and 6 adults.

Relation of the use of milk to the physical and scholastic progress of undernourished school children, F. F. Lininger (*Amer. Jour. Pub. Health*, *23* (*1933*), *No. 6*, *pp. 555–560*).—This paper presents data on the relation of the use of milk to the physical progress of pupils enrolled in special health classes in the Philadelphia public schools, tgether with a rather limited amount of

information on the scholastic progress of the same groups of children. The classes comprised pupils who were 13 percent or more underweight according to the Baldwin-Wood standards of age, height, and weight. For the 1930–31 school year there were 2,522 and for 1931–32, 1,611 individual records. Of the total, 931 represented pupils who received 0.5 pt. of milk daily in school. The milk consumption of the other pupils was estimated to range from nothing to more than 1 qt. daily.

In the first year of the study the average gain of the pupils consuming milk at home and at school was 29 percent greater, and in the second year 84 percent greater, than of those using no milk. Of 425 pupils in the 1931–32 study from whom the only records were obtained concerning actual consumption of milk, 184 received 1 qt. or more daily and showed an average semester gain of 4.34 lb. per pupil as compared with a gain of 3.98 lb. per pupil by those receiving less than 1 qt. daily. No relationship could be established between physical defects or family finances and gain in weight. The children with inadequate home food gained more when receiving sufficient milk than did those on adequate home food. Those who had good rest periods at home made greater gains than those having poor rest periods.

For the 2-year period the records of 45 percent of the pupils receiving milk showed improvement in scholarship, while improvement was recorded in only 24 percent of the cases in which milk was not used. A higher percentage (56 percent) of those who received milk at school improved in scholarship than was the case in the other groups.

The reliability of school survey data on milk consumption, and the relation of a school health program to home purchases of milk from regular dealers, F. F. LININGER (*State College: Penn. State Col., pp. 12, figs. 3*).—This complete report (mimeographed), with data, of a study made in connection with an experimental health program of the Akron, Ohio, public schools and the National Dairy Council, has been noted from another source (E.S.R., 70, p. 417).

The effect of nursery school training upon the later food habits of the child, E. H. CAMPBELL (*Child Devlpmt., 4 (1933), No. 4, pp. 329–345*).—The eating habits of a group of children of school age, 18 of whom had and 15 had not previously attended a nursery school, were observed at a summer camp for a period of 6 weeks to determine whether or not the former group had benefited from the special attention devoted to food habits in the nursery school. "The group of former nursery school children had a slightly higher mean age, mental age, and IQ, and a few more boys, presumably giving them a slight advantage in such a study. The nonnursery school group had a slight superiority in socio-economic status. Comparisons were made on the basis of a rating scale, the time spent in eating (i.e., finishing) meals, and the amount of food eaten. Some consideration was also given to food habits in relation to age, physical condition, the food habits of siblings, and the recency and duration of nursery school training."

About the same number of children in the two groups had faulty food habits, as shown by the time taken to eat meals and the amounts of food eaten. There was some evidence that the nursery school group children ate more milk and vegetables and the nonnursery school group more eggs and bread. There was some indication that a long period of nursery school attendance was more favorable than a short period in forming good habits, and that the shorter the time elapsing since leaving nursery school the better were the food habits. The food habits of children from the same home, even when one of a pair had and the other had not attended nursery school, were more likely to be similar than were those among nursery school children in general.

The similarity was greater than among nursery school children in general and much more striking than the difference between nursery school and non-nursery school children.

The author concludes that the home is a much more important factor than the nursery school in forming food habits and attitudes.

The influence of variations in systemic acid-base balance upon carbohydrate tolerance in normal subjects, G. THOMPSON, D. M. MITCHELL, and L. C. KOLB (*Biochem. Jour.*, *27* (*1933*), *No. 4*, *pp. 1253–1256*, *figs. 3*).—In this study of the relationship of changes in the acid-base balance of the blood to carbohydrate tolerance, acidosis and alkalosis were induced in three healthy young male subjects by the ingestion of massive doses of ammonium chloride and sodium carbonate, respectively. The diet was kept constant throughout, and the metabolic changes occurring during acidosis and alkalosis were followed by estimations of the CO_2-combining power of the blood plasma and of the total daily excretion of acid chloride and ammonia in the urine. A preliminary control period on a normal diet was followed by a period of acidosis and then a period of alkalosis. Glucose tolerance was estimated by following the changes in venous blood sugar after ingestion of 100 g of a standard dextrose dissolved in 250 cc of water.

Following the ingestion of large amounts of ammonium chloride, the alkali reserve of the blood plasma was reduced to a level comparable with that in diabetic coma, and the urinary excretion of acid was increased by from 100 to 200 percent and of ammonia by 300 percent. This was accompanied by hyperglycemia, with a slow return of blood sugar to fasting level following the glucose ingestion, but with no trace of glycosuria. The ingestion of large amounts of sodium bicarbonate was followed by no marked increase in the CO_2-combining power of the plasma and by very little variation in the blood sugar response to glucose ingestion.

It is concluded that "the CO_2-combining power of the plasma may sometimes be a misleading guide to the extent of the total upset in acid-base balance following alkali ingestion."

The haematopoietic response to intramuscular injections of concentrated human gastric juice, P. J. FOUTS, O. M. HELMER, and L. G. ZERFAS (*Brit. Med. Jour.*, *No. 3812* (*1934*), *pp. 141–143*, *figs. 4*).—An attempt to separate the active "intrinsic factor" in gastric juice, as reported by Morris et al. (E.S.R., 68, p. 869), from the known enzymes (pepsin and rennin) by ultrafiltration is reported, with the conclusion that "some change in fresh human gastric juice must take place before a hematopoietically active material can be demonstrated by the intramuscular injection into patients with pernicious anemia." Three explanations are suggested to account for this change: (1) That during the process of vacuum distillation the intrinsic factor acts upon an extrinsic factor present in the gastric juice in too small amounts to be active when fed by mouth, (2) that during the process of concentration a material irritating or toxic to the hematopoietic system is produced, and (3) that during the concentration a hormone is released or activated. The first two explanations are considered the most feasible.

Cystine and nephrotoxicity, M. E. BELL (*Biochem. Jour.*, *27* (*1933*), *No. 4*, *pp. 1267–1270*, *fig. 1*).—In this contribution to the extensive and conflicting literature on the question of possible damage to the kidneys resulting from excessive cystine feeding, data are reported showing that in young rats receiving as much as from 1 to 2 percent of free cystine in the diet no evidence of cystine nephrosis was obtained. "It is suggested that the condition reported by other investigators to occur in young animals is probably due to an infec-

tion to which an impetus is given by the altered oxidation-reduction potential in the intestines."

A study of fat metabolism, with special reference to nutrition on diets devoid of fat, E. Gregory and J. C. Drummond (*Ztschr. Vitaminforsch., 1 (1932), No. 4, pp. 257–287, figs. 8; Ger. abs., pp. 284, 285; Fr. abs., pp. 285, 286*).—This extensive investigation of the theory of Burr and Burr (E.S.R., 62, p. 292) that the condition in rats described as scaly tail is due to inadequate supply of linoleic acid or other related unsaturated fatty acids has led the authors to attribute the abnormal condition to a deficiency of one or more factors of the vitamin B complex, as already suggested by Hume and Smith (E.S.R., 65, p. 895), rather than to an inability to synthesize linoleic acid. The evidence leading to this conclusion includes the production of scaly tail in rats on diets containing cod-liver oil, failure to demonstrate the presence of linoleic acid in the body fats of rats fed a fat-free diet but proof of its presence in the liver fat, and failure to demonstrate the vitamin B sparing action of fats.

On the fatty acids essential in nutrition, G. O. Burr and W. R. Brown (*Soc. Expt. Biol. and Med. Proc., 30 (1933), No. 9, pp. 1349–1352, fig. 1*).—In this paper the authors meet the criticism of various workers that the scaliness of the skin and necrosis of the tails which occur in rats in the fat-free deficiency disease are not the result of fat deficiency but possibly of a vitamin B factor, with the argument that "there is no evidence that scaly skins and necrotic tails are specific for any single deficiency. Therefore, the production of these symptoms by one method does not preclude ready production by another." Attention is called to the fact that the diets used by the workers who have encountered such symptoms not curable by fat were all deficient in growth factors. The diets used by Funk et al. (E.S.R., 65, p. 794) were inadequate in vitamin B, those of Hume and Smith (E.S.R., 65, p. 895) low in vitamins B_1, B_2, and occasionally in A, and of those of Gregory and Drummond, noted above, deficient in one or more of the water-soluble vitamins. It is noted, moreover, that Hume and Smith found no scaliness or necrosis until the one hundred and eightieth day of the experiment and Gregory and Drummond until after 90 days, as compared with its appearance within a few weeks during the period of rapid growth in the authors' experiments.

It is emphasized in conclusion that an adequate supply of all water-soluble growth factors must be fed if the typical fat deficiency results are to be obtained, and that growth should approximate that given by the daily consumption of 0.65 g or more of high grade dried yeast.

Some abnormalities in rats subsisting on diets poor in mineral nutrients, A. M. Yudkin, L. R. Farquhar, and A. J. Wakeman (*Arch. Path., 17 (1934), No. 1, pp. 40–45*).—Data are reported and discussed on the effects of diets of varied inorganic salt content on the blood and bones of rats and on their general appearance. On diets low in salt skeletal abnormalities developed, accompanied in some cases by protrusion of the eyes. Histological studies of the tissues of the eye showed no definite changes in the structure of the eyeball or in the muscles controlling the movements of the eye. There were no signs of increased intra-ocular pressure or of invasion of the ocular muscles by mononuclear cells as have been noted in exophthalmos in man. The pituitary and suprarenal glands showed no abnormalities, but changes in the thyroid gland were apparent. Marked osteoporosis was revealed by X-ray photographs and chemical examination of the femurs.

"The realimentation of such animals with a diet that contained an adequate supply of inorganic salts or a sufficiently high level of calcium resulted in marked calcification of the bones, an increase in the hemoglobin content of the blood, and a general improvement in the appearance of the animals."

Copper in Chinese food materials, W. H. ADOLPH and T. P. CHOU (*Chinese Jour. Physiol., 7 (1933), No. 3, pp. 185–188*).—Data obtained by the Elvehjem-Lindow modification of the Biazzo method (E.S.R., 61, p. 612) are reported on the copper content of 40 Chinese food materials, including cereals, legumes, roots and tubers, leafy vegetables, pork, pork liver, and cow's milk. A comparison of the copper content of various foods as reported in the present paper with values for the same materials as reported by Elvehjem and associates shows close similarity in some instances, notably wheat, yellow corn, white corn, sweetpotatoes, potatoes, and cow's milk, but wide variations in others, including soybeans, turnips, radishes, spinach, and onions.

The silver nitrate staining reaction for ascorbic acid in the adrenal, pituitary, and ovary of various species of animals, J. GOUGH and S. S. ZILVA (*Biochem. Jour., 27 (1933), No. 4, pp. 1279–1286, pl. 1, fig. 1*).—The adrenals and pituitary glands of several species of animals were tested for their staining ability with silver nitrate in the dark. The tissues were examined macroscopically with the aid only of a hand lens and also microscopically.

In the ox marked staining was observed in the adrenal cortex, but little staining of the medulla in the fresh state and appreciable staining after standing. The pituitary glands stained more deeply than the adrenals, and there was slight staining of the corpora lutea of the ovary and slight staining of the testicles. In the dog both the cortex and medulla of the adrenals stained deeply, and there was also intense staining of the pituitary and quite intense staining of the corpora lutea. In the cat the staining was most marked in the adrenal cortex and the anterior lobe of the pituitary. In the rat there was intense staining of the adrenal cortex and no, or only slight, staining of the medulla. The pituitary showed staining, but not quite as marked as the adrenals, and there was slight staining of the ovary.

In man, of the 42 patients coming to autopsy none had shown clinical signs of scurvy. Of the entire number, 23 showed hardly any silver nitrate staining of the adrenals, but there was considerable staining of the pituitary. In the work with guinea pigs, animals protected from scurvy by decitrated lemon juice or by cabbage were used as well as scorbutic animals. Only in the animals protected from scurvy by the feeding of cabbage ad libitum was there any staining of the adrenals or pituitary glands.

Attention is called to the high content of reducing substance in the anterior lobe of the pituitary gland. Biological tests of the anterior lobe of the pituitary from the ox gave a value of from 40 to 50 international units of vitamin C per gram of fresh tissue.

[Vitamin studies at the Washington Station], E. L. BATCHELDER (*Washington Sta. Bul. 291 (1934), pp. 36, 37*).—Preliminary data are given on the vitamin C content of Delicious apples before and after storage, the vitamin C content of Jonathan apples and apple sauce prepared by a special method, and the vitamin A content of frozen blackberries.

Potency of vitamin preparations: A confusion of standards, J. C. DRUMMOND (*Lancet [London], 1934, I, No. 2, pp. 104, 105*).—Attention is called in this letter to claims frequently made for proprietary preparations offered to the public, mainly on the basis of their vitamin content, and to the confusion resulting from lack of uniformity in unit values. In the author's opinion this confusion can be dispelled only by a general adoption of the international units (E.S.R., 66, p. 690).

Potency of vitamin preparations, A. L. BACHARACH (*Lancet [London], 1934, I, No. 3, pp. 157, 158*).—In this reply to the letter of Drummond, noted above, certain obstacles in the way of using the provisional international units are discussed, including difficulties in the use of the carotene standard for

vitamin A and variations in the vitamin C content of lemon juice adopted provisionally as a standard. The advisability is suggested of the introduction of calciferol and ascorbic acid as new standard preparations of vitamins D and C, respectively, and the replacement of carotene in the standard preparation by a concentrate of pure or nearly pure vitamin A.

Potency of vitamin preparations, N. EVERS (*Lancet* [*London*], *1934*, *I*, *No. 3*, *p. 158*).—In this note, also in reply to the letter of Drummond, another complication involved in the adoption of international units is discussed, namely, that for both vitamins A and C chemical or physical tests are available which are thought to be as accurate as, and more time-saving and much less costly than, biological tests, but which yield values which cannot be stated in terms of the accepted international units, as there are at present no generally recognized factors expressing relationship between them.

The vitamin content of the mango fruit, M. E. F. CRAWFORD and E. O. V. PERRY (*Biochem. Jour.*, *27* (*1933*), *No. 4*, *pp. 1290–1293*).—This study supplements an earlier one (E.S.R., 69, p. 307) by further tests of mangoes of the same varieties but riper at the time of picking.

In the vitamin A tests, the best results were again obtained with the Alphonso variety and at the same dosage, 0.2 g. The place of origin had no appreciable effect on the vitamin A content. In the vitamin C tests, almost complete protection was obtained with 0.5 g of any of the Alphonso mangoes. With 0.25-g doses, mangoes of this variety from Surat and Bombay showed a rather higher potency than those from Poona. In the vitamin D tests, doses of 0.6 and 1 g were tested with negative results in all cases.

The threshold of activity of pure carotene: Researches concerning the exact value of the biological activity of the international standard of vitamin A [trans. title], L. RANDOIN and R. NETTER (*Bul. Soc. Chim. Biol.*, *15* (*1933*), *No. 6*, *pp. 706–723*, *figs. 8*).—Attention is called to the definition of the international unit of vitamin A as "the activity of 1γ (0.001 mg) of the international carotene standard" as being theoretically precise but practically vague owing to uncertainty concerning the significance of the term "activity." The studies reported were undertaken to determine what quantity of the international standard expressed in weight of pure carotene (number of γ) would permit growth in the young experimental rat and at the same time prevent or cure xerophthalmia. Observations were made of weight changes, survival periods, and the percentage and date of appearance of eye lesions in young rats receiving the international carotene standard as the sole source of vitamin A. Curative tests were also conducted. The basal diet used was that of Randoin and Simonnet (E.S.R., 69, p. 752), which when fed without vitamin A supplements is said to produce xerophthalmia invariably. The international standard of carotene was administered in solution in olive oil or peanut oil, great care being taken in the preparation of the solution and its preservation in small ampoules sealed under nitrogen.

In the preventive studies, quantities of 2, 4, and 10γ of the standard carotene were given daily to rats weighing 30 g at the beginning of the experiment. The feeding was continued for from 4 to 5 mo., but at the end of 3½ mo. the carotene was withdrawn from the diet of three lots of animals. On the smallest dose xerophthalmia was prevented and the survival period was prolonged. On the largest dose growth was not equal to that secured with 1 drop daily of an excellent cod-liver oil and was not appreciably better than on the dosage of 4γ. The latter quantity is considered the threshold dose of the international standard. Among the animals from which carotene was withheld after 3½ mo., the loss in weight was more abrupt in those which had received the

largest amount of carotene than in those receiving the smaller amounts, but death was somewhat prolonged.

In the curative tests 4γ likewise appeared to be the threshold dose. Attention is called to precautions which must be taken to secure consistent results in curative tests. It is considered essential to use animals of the same weight and preferably of the same litter. The time of year in which the experiments are conducted is also thought to influence the results. In the authors' experience rats placed on experiment from October to January or February developed less and are less resistant than animals of the same weight placed on experiment from January to May.

The interrelation of a gonotropic hormone and vitamin A, S. B. D. Aberle (*Amer. Jour. Physiol., 106 (1933), No. 2, pp. 267–272*).—The possibility of a relationship between vitamin A and the gonotropic hormone which produces cells in the vaginas of spayed animals similar to those formed in pregnancy was studied by injecting rats suffering from vitamin A deficiency with a placental extract standardized for its production of mucoid vaginal cells and comparing the reaction with that in controls receiving sufficient vitamin A. The controls invariably responded to the extract, but there was no change in the A-deficient rats. "This shows that avitaminosis of A was responsible for preventing the characteristic action of a hormone."

Interrelations of hormones and vitamins (*Jour. Amer. Med. Assoc., 102 (1934), No. 6, p. 458*).—Editorial comment on the report by Aberle noted above.

Studies on the effect of vitamin A on serum cholesterol [trans. title], H. J. Jusatz (*Klin. Wchnschr., 13 (1934), No. 3, pp. 95–97, figs. 2*).—In rabbits fed excessive amounts of vitamin A concentrate, Vogan, for 13 days after a preliminary period on a vitamin A-free diet, a marked increase in the cholesterol content of the blood was noted, together with an increase in the neutral fat content of the serum.

The occurrence of spirochetes in the vaginas of rats on a vitamin A-free diet [trans. title], W. Hohlweg and V. Fischl (*Klin. Wchnschr., 12 (1933), No. 29, pp. 1139, 1140, figs. 2*).—Female rats in which keratosis of the vagina had developed on a vitamin A-free diet were found to have a special form of spirochetes in their vaginal flora, as determined by dark field illumination of vaginal cultures. No spirochetes could be detected in the vaginas of normal or castrated rats, or of those cured of the keratosis by peroral additions of vitamin A.

Nutritional night blindness, D. L. Wilbur and G. B. Eusterman (*Jour. Amer. Med. Assoc., 102 (1934), No. 5, pp. 364–366*).—The report is given of a case of night blindness in a man who had lived on a general diet containing reasonably large quantities of milk, butter, and fresh vegetables, but who had been suffering for 2 years from symptoms of gastrocolic fistula, with concomitant diarrhea. The disappearance of the night blindness following the surgical repair of the fistula and resumption of health is thought to furnish indirect proof of the relationship of night blindness to nutritional disturbances, probably the failure to assimilate and utilize vitamin A.

Injury from vitamin A.—II, Histological studies of the organs of rats [trans. title], W. Laubmann (*Klin. Wchnschr., 12 (1933), No. 30, pp. 1171–1174, figs. 5*).—Histological changes of the organs of rats suffering from vitamin A overdosage, as noted in the first paper of the series by Drigalski and the author (E.S.R., 70, p. 132), are described and illustrated. The most marked changes were in the kidneys, which showed glomerular nephrosis, with calcification. Similar changes on a smaller scale were noted in the spleen and liver and degenerative changes in the testicles. The death of some of the animals in the earlier study is attributed to the kidney changes.

Avitaminosis.—XVI, Production of gastric ulcers in the albino rat as a result of specific influence of deficiency of vitamin B, B. SURE and H. S. THATCHER (*Arch. Path., 16 (1933), No. 6, pp. 809–816, figs. 2*).—This continuation of the series of papers noted previously (E.S.R., 69, p. 617) reports a further investigation of the specific effects of a deficiency of vitamin B (B_1) uncomplicated by inanition on the weight of the body, suprarenal glands, and organs of the albino rat, and describes gastric ulcers as found in four animals on the B-deficient diet. In one of the animals the ulcer was of a chronic and in the others an acute type.

These results, together with similar findings of Dalldorf and Kellogg (E.S.R., 68, p. 708), lead the authors to suggest that "vitamin B therapy may be indicated in human gastric ulcer."

Avian polyneuritis.—Further studies on the action of vitamin B_1 concentrates in vitro, A. P. MEIKLEJOHN (*Biochem. Jour., 27 (1933), No. 4, pp. 1310–1320*).—Continuing the series of studies which have established the relationship between vitamin B_1 and the oxidative removal of lactic acid in the brains of pigeons (E.S.R., 68, p. 867), the hypothesis that the defect in the vitamin B_1-deficient brain is the failure in oxidative removal of lactate was tested by the addition of a vitamin B_1 concentrate to deficient brain in vitro and determining the oxygen uptake and concentration of lactate. There was, however, no apparent removal of the lactate corresponding to the increased oxygen uptake induced by the addition of the vitamin B_1 concentrate.

The author concludes that "the lesion in vitamin B_1-deficient brain affects an oxidase system that is associated with lactate, but is not concerned with the removal of lactate itself in isolated brain tissue."

The determination of the vitamin C value of ascorbic acid, K. M. KEY and B. G. E. MORGAN (*Biochem. Jour., 27 (1933), No. 4, pp. 1030–1035, figs. 2*).—A sample of ascorbic acid furnished by Szent-Györgyi was tested for vitamin C in three different experiments, using the modified Höjer method described by Key and Elphick (E.S.R., 67, p. 189). Fresh lemon juice was tested simultaneously for comparison.

The ascorbic acid was found to contain 7.4 international units per milligram, a quantity only about half that claimed by Szent-Györgyi. There was no evidence of deterioration of the potency of the ascorbic acid during three months' storage in a nitrogen-filled tube at 0°–5°.

The possibility is suggested that lemon juice may vary its vitamin C potency, and that ascorbic acid is a better standard for vitamin C than lemon juice.

Content of vitamin C in canned Satsuma orange (Citrus unshiu, Marc.): A preliminary report, R. SAITO (*Bul. Agr. Chem. Soc. Japan, 9 (1933), No. 1–3, pp. 28–31*).—The pressed juice of canned Satsuma orange (*C. unshiu*) afforded complete protection against scurvy to guinea pigs weighing about 250 g when fed in doses of 5 and 8 cc daily for a 58-day experimental period as a supplement to the usual vitamin C-deficient diet of oats, wheat bran, and autoclaved milk, supplemented with cod-liver oil. Of two scorbutic guinea pigs given 10 cc of the juice daily, one recovered completely in 40 days and the other showed slight symptoms of scurvy after 31 days.

Inasmuch as the protective dose of the fresh juice of the Satsuma orange had been reported by Iwasaki (E.S.R., 57, p. 197) to be from 4 to 5 cc daily, the author concludes that no loss in vitamin C took place on canning.

The canning was done by the so-called acid method, which consisted in immersing the detached segments of the peeled orange in 10 percent hydrochloric acid at 90° C. for from 30 to 40 sec., draining, washing with water, removing the hydrochloric acid by diffusion in a concentrated solution of salt, washing with cold water, adding a sugar solution of 28° B., packing, and sterilizing for 10 min. at 100° C.

Data are included on the total and reducing sugars and free acid as citric in the fresh juice and in the solid and liquid portions of the canned product.

Application of the capillary resistance test as a measure of vitamin C nutrition, R. E. STOCKING (*Arch. Ped., 50 (1933), No. 12, pp. 823–831, fig. 1*).—This paper describes in considerable detail the capillary resistance test as developed by G. F. Göthlin for determining nutritional status with respect to vitamin C, and reports the results obtained with it in testing a total of 81 children of preschool and early school age attending a clinic. According to the standards established by Göthlin,[3] as applied to the Nordic race, there was no indication of capillary resistance below normal in this group, although there was a suggestion of a slightly reduced capillary resistance in the spring in the children examined in the fall and spring. The importance of a further study of this method for establishing vitamin C standards is emphasized.

The protective influence of gestation on vitamin C deficiency [trans. title], G. MOURIQUAND and J. SCHOEN (*Compt. Rend. Acad. Sci. [Paris], 197 (1933), No. 2, pp. 203, 204*).—Attention is called to previous observations of the senior author and his associates that scurvy does not develop at all, or develops more slowly, during pregnancy in guinea pigs on a vitamin C-deficient diet. No explanation is forthcoming, but attention is called to the fact that other nutritive disturbances may remain latent during pregnancy but develop very rapidly after delivery, including parathyroid insufficiency, diabetes, and tuberculosis.

Action of vitamin D and of the parathyroid hormone on the calcium metabolism as interpreted by studying the effect of single doses on the calcification of dentin, I. SCHOUR and A. W. HAM (*Arch. Path., 17 (1934), No. 1, pp. 22–39, figs. 14*).—The hypothesis advanced by Ham and Portuondo (E.S.R., 70, p. 428) that calcification in hypervitaminosis D is due to the ability of vitamin D to increase the amount or activity of the parathyroid hormone in circulation, which in turn attracts calcium from the various tissues of the body, particularly the bones and intestines, was tested by following the process of calcification in the growing incisors of rats during the rise and fall of the serum calcium level following the administration of single doses of either vitamin D or the parathyroid hormone.

Histological studies of the dentin at varying intervals of from 16 to over 100 hr. following the oral administration of a single massive dose of irradiated ergosterol and the subcutaneous injection of 40 units of parathyroid extract (Collip) showed that single massive doses of either substance resulted in the formation first of a strip of imperfectly calcified and second a strip of normally or excessively calcified dentin. The former is thought to represent the area calcified while the serum calcium level was rising, and the latter the area calcified while it was falling after hypercalcemia.

"The results could be explained by the theory which postulates that vitamin D acts through the parathyroid mechanism provided the shift in calcium during the upswing of the curve is considered to be toward the blood and, during the downswing of the curve, from the blood to the bones, dentin, soft tissues, and intestine."

Microphotographs illustrating the changes in the dentin are included.

A deficiency disorder induced in suckling young rats bred on a purified synthetic diet with "Glaxo casein" (caseinogen) as sole source of protein, L. W. MAPSON (*Biochem. Jour., 27 (1933), No. 4, pp. 1061–1068, figs. 8*).—An extension of the earlier investigation (E.S.R., 68, p. 860) which had led to the postulation of a new essential dietary factor to which the name physin was provisionally given is reported, with evidence suggesting its possible identity with the Coward factor (E.S.R., 62, p. 589).

[3] Skand. Arch. Physiol., 61 (1931), No. 6, pp. 225–270, figs. 3.

The substitution of Glaxo casein for "light white casein" in the basal diet led to a more complete deficiency in the new factor, as shown by inability to raise young. Beneficial results were secured on feeding a 90 percent acetone extract of light white casein and a 90 percent alcoholic and acetone extract of liver. Varying the content of manganese, or of wheat embryo as the source of vitamin E, in the diet was without effect. The presence of both the Coward factor and physin in light white casein and their absence in Glaxo casein, the similarity in solubility of both factors, and their like occurrence in different materials suggest but do not absolutely prove their identity.

Some observations on achlorhydria and anaemia, S. J. HARTFALL (*Brit. Med. Jour., No. 3812 (1934), pp. 136–141*).—This lecture includes a definition of achlorhydria; tests for its recognition; its distribution, pathology and significance, relation to chronic gastritis, and clinical applications; a classification of anemias with special attention to those in which achlorhydria is involved; and a discussion of the treatment of achlorhydria and related anemias, including the use of hydrochloric acid, liver extract, stomach preparations, and iron compounds.

The etiology and treatment of anemia in pregnancy, M. B. STRAUSS (*Jour. Amer. Med. Assoc., 102 (1934), No. 4, pp. 281–283*).—The various types of anemia which may occur in pregnancy are classified essentially as follows: (1) The "physiologic anemia" of pregnancy, which, in the author's opinion, is only the effect of hydremia and disappears once the blood volume readjustments of the puerperium are over; (2) the hypochromic anemia of pregnancy, which is due "either to a direct dietary deficiency or to a deficiency conditioned by gastric anacidity, hypoacidity, or associated defects in the presence of the fetal demand for blood-building materials; and (3) the macrocytic anemia of pregnancy, which is generally due to the temporary lack in the gastric juice of the intrinsic factor (E.S.R., 68, p. 280) and occasionally to a similar lack of the extrinsic factor. The hypochromic anemia can be relieved completely either during or after pregnancy by the administration of iron in rather large doses, and the macrocytic type can ordinarily be relieved by liver therapy, although iron is frequently required.

Inasmuch as disturbances in gastric secretion are fairly common in pregnancy, the necessity is emphasized of consuming a diet adequate in protein and iron. It is also considered advisable to supplement the diet with iron as is commonly done with calcium.

Studies in the nutritional anemia of the rat.—IX, Observations on the anemia of pregnancy, H. H. BEARD and V. C. MYERS (*Amer. Jour. Physiol., 106 (1933), No. 2, pp. 449–453*).—In this continuation of the series of papers noted previously (E.S.R., 70, p. 885), data are reported on weekly determinations of hemoglobin and red blood cells during pregnancy and lactation of 87 female rats in the course of 138 pregnancies. The rats were on the Sherman stock diet supplemented with lettuce three times a week and, in addition, with 0.5 mg of iron, 0.5 g of liver extract, and 0.5 g of yeast per rat per day, respectively.

The results obtained are comparable to those reported by Mitchell and Miller (E.S.R., 66, p. 490) in a similar investigation in showing a fall of hemoglobin during pregnancy even when supplements were given to prevent the onset of anemia. The average decreases in hemoglobin during pregnancy in the present study were 3.5 g for the controls, 1.6 for those receiving iron, 4.3 for those receiving liver extract, and 5.2 g for those receiving yeast. Attention is called to the similarity between the anemia which develops in the rat during pregnancy and early growth and that which has recently been reported by Strauss (noted above) as occurring during human pregnancy and infancy. It is suggested that the rat should prove a valuable experimental animal for further studies in this field.

Treatment of anemia in children with ferric and ferrous compounds, reduced iron, and cupric sulphate, M. C. LOTTRUP (*Amer. Jour. Diseases Children, 47 (1934), No. 1, pp. 1–8, fig. 1*).—A comparison of the effects of ferrous and ferric salts and reduced iron supplemented in certain cases with copper sulfate on anemia in children, including two sets of twins, is reported, with the conclusion that ferrous preparations are preferable to ferric, that reduced iron is effective in certain cases but may cause discomfort, and that the addition of copper sulfate to iron preparations seems to be without effect.

Raw basic feeding in the prevention and treatment of dental caries, I. N. KUGELMASS, T. B. KING, and C. F. BÖDECKER (*Jour. Amer. Dental Assoc., 21 (1934), No. 1, pp. 110–125, figs. 4*).—Included in this discussion of the theory that a base-forming dietary is an important factor in preventing dental caries (E.S.R., 70, p. 571) is a description of the method of determining the Bödecker life caries index. This is based upon the assumption that the teeth of human beings have an average of 5 areas of varying susceptibility to dental caries per tooth, making a total of 160 areas for the 32 permanent teeth, or 100 areas for the 20 deciduous teeth. The caries index is obtained by dividing the number of areas showing caries by the total number of areas, separate indices being necessary for the deciduous and permanent teeth. The report presents original data upon which the conclusions noted in the earlier report are based.

Gestational polyneuritis, E. D. PLASS and W. F. MENGERT (*Jour. Amer. Med. Assoc., 101 (1933), No. 26, pp. 2020–2023*).—Clinical observations on gestational polyneuritis, as reported in the literature and from the authors' experience, are discussed and summarized, with the conclusion that prophylaxis on the basis of high vitamin B feeding offers the best hope in combating this condition, which is thought to be less rare than generally considered. In the discussion of this paper, attention is called by J. H. Sure to a condition associated with pain and tingling in the extremities, which has been noted in the latter months of pregnancy and has been relieved by the administration of calcium lactate.

Rickets in a breast-fed infant, B. SANDLER (*Lancet [London], 1933, II, No. 14, pp. 757, 758*).—A case report is given of well-developed rickets, demonstrable both clinically and radiologically, in a 5-weeks-old breast-fed infant whose mother subsisted almost entirely on bread and butter, sago, tea, and a little milk. The mother showed no sign of osteomalacia on radiography of the long bones.

***Calcium and phosphorus studies.*—VI, *Observations on the treatment* of late rickets with viosterol based on the study of twenty-three cases,** D. H. SHELLING and K. B. HOPPER (*Amer. Jour. Diseases Children, 47 (1934), No. 1, pp. 61–90, figs. 7*).—In continuation of this series of papers, some of which have been noted previously (E.S.R., 68, p. 130), observations are reported on the effect on patients with late rickets of treatment with viosterol. Five types of late rickets are recognized: "(1) Persistent infantile rickets, the infantile disease having persisted either because it was never properly treated or was refractory to therapeutic measures; (2) recurrent rickets, that is, rickets recurring in a child who has recovered from the disease; (3) late rickets in the true sense, that is, occurring for the first time after the third year, sometimes termed juvenile osteomalacia; (4) rickets developing in association with celiac disease; and (5) renal rickets." Of these, the first three types are considered to have the same etiological background, celiac rickets to be of more complicated origin, and renal rickets a rachitic condition of the skeleton secondary to renal insufficiency.

In the present study none of the 21 negro and 2 white subjects had renal rickets. In 1 of the 2 white children the rickets was complicated with celiac disease. Twelve of the children were between 1 yr. 8 mo. and 3 yr., 5 between

3 and 4, and 6 between 4 and 10 yr. of age. Some of them had been given the usual amount of vitamin D over long periods of time, with only partial healing, and others had received no treatment prior to the present study.

With a single exception, a child of 10 yr. who received a relatively small dose of viosterol for only 45 days, viosterol brought about complete healing. *Doses of from 10 to 20 drops daily were used at first, but in most cases* were increased to 60 drops daily. In most cases the treatment was continued for from 6 to 8 mo. and in two cases was extended to about 13 mo. In no case were any toxic effects noted. In the subject with celiac disease the osteoporosis and rickets were completely cured within 4 mo. by a daily dose of 40 drops of viosterol. The report includes a detailed description of a few of the cases and a discussion of the factors which aid or hinder the activity of viosterol in late rickets. The inadvisability of using vitamin D preparations in renal rickets is emphasized.

Treatment of scurvy in man with intravenous injection of ascorbic acid, P. Schultzer (*Lancet [London], 1933, II, No. 11, pp. 589, 590, fig. 1*).—A report is given, with complete case record, of the rapid cure of severe scurvy in an elderly man by intravenous injections of ascorbic acid. The patient, who had been on a diet almost free from vitamin C, was placed on a diet furnishing no potatoes or other vegetables, fruit, or raw milk and was given intravenous injections of 40 mg of ascorbic acid dissolved in 3 cc of normal saline. The injections were given daily for 2 weeks and then every other day. Marked improvement appeared within 5 days. Göthlin's capillary resistance test showed 140 petechiae just before treatment was instituted and only 4 after 2 weeks of treatment.

Infantile scurvy treated with ascorbic acid, E. Svensgaard (*Lancet [London], 1933, I, No. 1, pp. 22, 23*).—Case reports are given showing the recovery of two infants in a few days from pronounced scurvy on a diet free from vitamin C but supplemented with 30 mg daily of crystalline ascorbic acid.

Ascorbic acid as the antiscorbutic factor, E. L. Hirst and S. S. Zilva (*Biochem. Jour., 27 (1933), No. 4, pp. 1271–1278, figs. 2*).—Experiments dealing with the antiscorbutic activity of a number of specimens of ascorbic acid, its oxidation products, and ascorbic acid regenerated from one of its oxidation derivatives are reported, with results confirming the earlier observation of Zilva (E.S.R., 57, p. 790) that ascorbic acid when tested immediately after oxidation with iodine shows little loss in antiscorbutic activity. Of the explanations offered at that time by Zilva and later by Tillmans, Hirsch, and Siebert (E.S.R., 69, p. 8), the latter is considered the correct one—namely that the vitamin while still retaining most of its activity was reversibly oxidized. The authors are of the opinion, however, that all equilibrated oxidation products are, weight for weight, much less active than the ascorbic acid regenerated from them. "It, therefore, appears that ascorbic acid is active per se. The alternative explanation that vitamin C is associated with ascorbic acid and like it is reversibly oxidized and regenerated quantitatively is much less plausible."

Treatment of obesity in a group of children, H. Mulier and A. Topper (*Amer. Jour. Diseases Children, 47 (1934), No. 1, pp. 25–33, fig. 1*).—The methods followed in this study of the treatment of exogenous obesity in 25 children (12 boys and 13 girls ranging from 8 to 14 yr. of age), consisted in a low caloric intake to force the body to use up its own stores of fat, a high protein intake to stimulate growth and metabolism, reduction of salt and water to eliminate retention of water in the body, and increased physical activity to stimulate metabolism.

The treatment, the average duration of which was 4½ mo., resulted in total reductions in weight ranging from 9 to 24 lb. per subject, with an average

total loss of 13.2 lb. and a weekly loss of 0.75 lb. per child. The average increase in growth in height was 1½ in. as compared with the expected growth for the same period of time of 1 in. The effect of the low caloric diet, which might have depressed the basal metabolism, was evidently offset by the effect of the high percentage of protein in the diet and the increased muscular activity, for normal values were maintained.

The subjective changes observed included better eating habits persisting after the treatment was finished, a feeling of well-being, an increased capacity for work, and an increased interest in studies and school activities.

HOME MANAGEMENT AND EQUIPMENT

Common sense applied to motion and time study, A. H. MOGENSEN (*New York and London: McGraw-Hill Book Co., 1932, pp. 228, figs. 110*).—This volume is chiefly a compilation of papers by various authors dealing with motion and time studies as applied to different industries and occupations. Credit is given throughout the text to the pioneer work in the field of F. B. and L. M. Gilbreth. Considerable space is devoted to the use of the motion-picture camera in operation analyses.

[Studies in home management and equipment] (*Indiana Sta. Rpt. 1933, pp. 35–37, fig. 1*).—This progress report (E.S.R., 67, p. 637) summarizes the results obtained in a comparison of the efficiency of five electric range ovens, a continuation of the study of efficient kitchen arrangement, and studies of current consumption for various pieces of electric household equipment.

Electrical equipment relieves household labor, G. M. REDFIELD (*Purdue Agr., 27 (1933), No. 9, pp. 80, 85*).—A popular article based upon the studies noted above.

MISCELLANEOUS

List of bulletins of the agricultural experiment stations for the calendar years 1931 and 1932, C. E. PENNINGTON (*U.S. Dept. Agr., Misc. Pub. 181 (1934), pp. 77*).—This list, arranged by States and containing author and subject indexes, supplements that previously noted (E.S.R., 66, p. 599).

Forty-fourth Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut, for the year ending June 30, 1932, W. L. SLATE ET AL. (*[Connecticut] Storrs Sta. Rpt. 1932, pp. [321], figs. 41*).—This consists of reprints of Bulletins 181–191, previously noted.

Forty-sixth Annual Report of [Indiana Station], 1933, J. H. SKINNER and H. J. REED (*Indiana Sta. Rpt. 1933, pp. 82, figs. 27*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Forty-sixth Annual Report of the [Michigan Station], 1933 (*Michigan Sta. Rpt. 1933, pp. 165–256, figs. 14*).—The experimental work not previously reported is for the most part noted elsewhere in this issue. Analyses of vinegar (pp. 210, 211) and of water supplies and bathing pools (pp. 211, 212) are included.

Forty-fourth Annual Report [of New Mexico Station, 1933], F. GARCIA (*New Mexico Sta. Rpt. 1933, pp. 72, figs. 5*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Current investigations of the North Carolina Agricultural Experiment Station, 1933–34 (*North Carolina Sta. Bul. 294 (1934), pp. 15, fig. 1*).—This bulletin lists the active research projects, the available publications, and the names of part-time and full-time workers of the station.

Forty-third Annual Report [of Washington Station], 1933, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 291 (1934), pp. 75*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

California University and Station.—The honorary D.Sc. degree was conferred by the Massachusetts College on June 11 on Ralph E. Smith, head of the division of plant pathology.

Kansas College and Station.—The leave of absence of L. E. Call, dean of the division of agriculture and director of the station, has been extended to December 31, 1934, in order that he may continue to serve as president of the Federal Land Bank at Wichita. George Montgomery, assistant professor of agricultural economics and in charge of marketing investigations with fruits and vegetables, has been granted leave for the ensuing academic year to be spent in graduate work at Harvard University.

At the recent commencement the honorary D.Sc. degree was conferred on Dr. A. S. Hitchcock, in charge of grass investigations of the U.S.D.A. Bureau of Plant Industry, and the LL.D. degree upon Martin Mortensen, head of the department of dairy industry of the Iowa College and Station.

Nebraska University and Station.—Eldon B. Engle, assistant professor and assistant in soils, has been given a year's leave of absence, beginning May 1, to accept a position with the Soil Erosion Service, U.S. Department of the Interior, at Albion, Nebr. Harold Hedges, research associate in rural economics, was granted a year's leave of absence beginning July 1 for the purpose of acting as secretary of the Bank for Cooperatives at Omaha.

Cornell University and Station.—J. E. Rice, head of the poultry department since its establishment in 1905, has retired from active service.

North Dakota Station.—Esther Latzke, research specialist in home economics, has resigned to engage in commercial work.

South Dakota College and Station.—The resignations are noted of Frank T. Hady, assistant professor of agricultural economics in the college and assistant agricultural economist in the station, to accept a position with the Division of Subsistence Homesteads, U.S. Department of the Interior, and R. E. Post, acting department head, to accept a position with the Division of Statistical and Historical Research, U.S.D.A. Bureau of Agricultural Economics. Gabriel Lundy, now assistant professor of agricultural economics and assistant agricultural economist, has been designated as the acting head of the department, and R. B. Westbrook has been appointed assistant professor.

Tennessee Station.—G. M. Stone, assistant in botany at the Indiana Station, has been appointed assistant plant pathologist.

Washington College and Station.—Rex E. Willard, head of the division of farm management and agricultural economics, has been granted leave of absence for 1 year beginning May 15 to become regional director of the Pacific Northwest Planning Division of the U.S.D.A. Agricultural Adjustment Administration. His territory will include Washington, Oregon, and Idaho, with headquarters at this station.

Soil survey work is being undertaken in Yakima County in cooperation with the U.S.D.A. Bureau of Chemistry and Soils, and it is expected that the survey will be extended to Snohomish County during this season.

Association of Land-Grant Colleges and Universities.—The 1934 meeting of this association will be held in Washington, D.C., from November 19 to 21.

EXPERIMENT STATION RECORD

VOL. 71 SEPTEMBER 1934 No. 3

EDITORIAL

THE AGRICULTURAL EXPERIMENT STATIONS IN 1933

The recent publication by the Office of Experiment Stations of its annual report on the work and expenditures of the agricultural experiment stations for the fiscal year ended June 30, 1933, extends by another year the period for which summarized information is available for this group of institutions. In much the same way as in former years the report reveals how the funds for the support of the State experiment stations and those in Alaska, Hawaii, and Puerto Rico were used and some of the significant results of their work. It also gives the customary information on their personnel, facilities for research, programs and projects and their coordination and readjustment, and other matters pertaining to the organization, administration, and progress of the stations.

The total income of the stations for the year was $15,576,632.98. This was a decrease of $1,668,530.85, or 9.6 percent, from the previous year and of $2,479,649.09 from the high-water mark of 1931. It was still in excess, however, of that for any year prior to 1929.

The Federal appropriations to the States under the Hatch, Adams, and Purnell Acts, aggregating $4,359,000, were maintained in full, but State support receded from $9,501,097 to $7,740,248, sales receipts from $1,311,712 to $1,151,252, fees from $434,425 to $414,416, and miscellaneous income from $589,509 to $509,243. On the other hand and perhaps in response to a husbanding of resources, the accumulated balances increased from $821,391 to $1,298,915.

The decline in State support was general, although eight stations reported increases during the year. Among these was Alabama with an increase from non-Federal sources from $200,257 to $275,311, Maryland from $119,906 to $136,364, Mississippi from $34,401 to $90,195, and [New York] Cornell from $937,363 to $1,056,263. On the other hand, the remaining stations experienced reductions in income of from 1.5 to 43.9 percent.

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The shrinkage in revenues again was followed by a reduction of expenditures for research facilities. The value of additions to build-

ings and equipment for station use declined from $1,885,003 to $1,452,327. Among the most noteworthy additions were an entomological building completed at the Citrus Experiment Station at Riverside, Calif., at a cost of $150,000; a fireproof genetics laboratory, completed by the Iowa Station at a cost of $11,000; a new dairy barn and experimental laboratory for the Kansas Station, costing $45,000; an agronomy field house for the Minnesota Station, costing $30,000; and a fireproof seed house and agronomy laboratory at the Nebraska Station, costing $30,000.

Expenditures for scientific apparatus totaled $220,745, an amount substantially equivalent to the $226,534 available in 1932. For library purposes, however, only $46,221 was expended, a shrinkage of nearly $10,000 for the year and of about 30 percent from 1931. Travel expenses decreased from $548,018 to $427,351.

Although the number of station publications received by the Office increased from 845 to 862, the amount of funds expended under this head was curtailed from $336,412 to $278,220. The nature of the publications, it is reported, showed "no material change except a possible trend toward putting greater emphasis on the significance of the results of research from the economic, social, and practical standpoints."

As might be expected, the report notes that maintenance of an efficient personnel was one of the most serious problems with which the stations had to deal. Expenditures for salaries decreased from $8,286,859 to $7,779,252. A shortage of funds "resulted in reduction in salaries and loss of some well-trained, experienced men and in many shifts, especially in the lower grades."

In spite of decreased funds and facilities, a determination by individual research institutions to continue to render as great service to agriculture as formerly was again strongly in evidence. Manifestations of this spirit were shown in the increased interest in cooperation and coordination of effort. Within institutions, there was a tendency to the greater pooling of research finances, equipment, and personnel, and there was also a strong effort to maintain the mutually helpful relations between Federal and State agencies, although these were broken down partly, or wholly in some instances, where financial support was either seriously curtailed or removed entirely. A total of 802 cooperative undertakings in which the stations and the Federal Department of Agriculture took part was recorded, and while this was a decrease in number of 7 percent, this was accounted for in part by a completion of several studies and a consolidation and strengthening of others. All but two of the stations cooperated with the Department, the number of cooperative agreements per station ranging from 2 to 40 and covering essentially the same range

of subject matter as in the previous year. There was also a large amount of informal cooperation.

This close cooperation is of special pertinence because of its relation to the important question of alleged duplication of work. Concerning this point, the report states that "wasteful duplication of work is sometimes charged against the stations, but when the great variety and range of conditions and problems with which stations have to deal is considered, it is difficult to name specific cases which can without qualification be called undesirable or unwarranted duplication. There are, on the other hand, many examples of necessary repetition and verification under varying environmental and economic conditions, as well as a large and increasing number of local emergency and service calls which the stations must meet. Much that might seem on superficial examination to be unnecessary duplication is in reality very important if the results of scientific research are to be fully and usefully applied in practice."

During the year unusual activity was noted in revision, readjustment, and coordination of research programs and projects. The aim in view was to adjust these programs and projects to "actual and prospective reductions of income and to make them meet more fully emergency needs and calls for assistance, at the same time contributing effectively to the broader national policies." Special reference is made to such new undertakings as the agricultural adjustment program of the Illinois Station, the economic and sociological study of the Southern Appalachian Highlands by the stations of that area, the land use and planning program initiated in Georgia, Minnesota, New York, Pennsylvania, Wisconsin, and a number of other States, and the studies under way of the sociological effects of the interaction of urban unemployment, agricultural distress, and land settlement.

Unfortunately these more extensive demands for economic and rural life research developed concurrently in most cases with a drastic curtailment of station funds, and this has greatly complicated the problems of readjustment to include the new responsibilities. The report, however, takes the view, borne out by the records for the year, that "the stations have met the situation confronting them with remarkable promptness and vision. . . . With budgets reduced and surrounded by many uncertainties, the directors have readjusted salaries, expenses, personnel, programs of research, and Federal cooperative relations with little lost motion, and everything considered measured up fully and well to the agricultural emergency."

Surely this was a notable achievement under the circumstances.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Optimum soil-nitrate levels for table beets: Their effect on certain nitrogen-fractions in juice expressed from the leaves, J. B. Smith and F. S. Schlenker (*Rhode Island Sta. Bul. 242 (1934), pp. 28, figs. 5*).—Report is made upon 3 years' experiments on the concentrations of certain fractions of the nitrogen in the juice expressed from beet leaves, and on the growth of the crop. The nitrate levels chosen were maintained by biweekly analysis of the soil, followed by applications of sodium nitrate from analyzed solutions calculated to replace losses. Each application was carried into the soil by overhead irrigation with small, measured quantities of water.

The rate of growth produced by concentrations of less than 10 p.p.m. of nitrate nitrogen was slow and took place at the expense of the nitrogen reserves of the soil. At 25 p.p.m. the growth rate was more rapid and was satisfactory for thin stands, but did not produce the largest early harvest. Under the climatic conditions of the experiment, with optimum soil moisture and a silty loam soil, 50 p.p.m. of nitrate nitrogen maintained during the first two-thirds of the growth period proved notably effective. Maintenance of high levels during the final third of the growth period was only to be secured at the expense of excessive quantities of nitrogen.

The normal stand consisted of rows 14 in. apart with 4-in. spaces between plants. Doubling the stand by leaving only 2-in. spaces between plants decreased the growth rate markedly in one season, though insignificantly in another; but "nitrate levels of 50 p.p.m. largely overcame the deleterious effects of plant competition, and the larger ultimate yields made the thicker stands desirable."

Four nitrogen fractions of the expressed juice of leaves, from which midribs and petioles were removed, and of the combined midribs and petioles, were studied. Growth rate and the concentrations of ammonium, α-amino, and amide nitrogen in juice from the plants were shown not to be correlated. "Apparently these fractions do not reflect the differences noted for beets grown under these conditions and cannot serve as indexes to current needs for nitrogen." On the other hand, the nitrate nitrogen in the juice "reflected the rate of supply consistently, and this was correlated with growth rate, but varying rates of metabolism accompanying weather changes proved more effective than soil nitrate levels in the determination of nitrate accumulation in the plant juice. The resulting fluctuation makes it impossible to fix a single value for optimum conditions. The greater concentrations in the midrib and petiole make this a more favorable tissue than the remainder of the leaf, but fluctuations are considerable for both." In general, less than 500 p.p.m. of nitrate nitrogen in the midrib-petiole juice, or 50 p.p.m. in that from the remainder of the leaf, accompanied a suboptimum rate of growth.

[Studies of sugarcane juice in Puerto Rico] (*Puerto Rico Sta. Rpt. 1933, pp. 12, 13*).—Variations in the phosphoric acid content of sugarcane varieties

and problems involved in cane sirup manufacture in Puerto Rico are briefly noted.

Fruit jellies.—VIII, The role of pectin.—4, The physico-chemical properties of pectin, P. B. Myers and G. L. Baker (*Delaware Sta. Bul. 187 (1934), pp. 39, figs. 6*).—The present bulletin continues the station's series of reports on pectin chemistry researches (E.S.R., 65, p. 407).

The investigation here noted has shown that pectin in the unhydrolyzed condition is monoarabino-monogalacto-diacetyl-heptamethoxyl-octagalacturonic acid. "The nucleus of the pectin molecule is octagalacturonic acid, most likely formed by the union of 2 molecules of tetragalacturonic acid with the elimination of 1 molecule of water. The tetra-acid is most likely formed into a ring compound by the combining of 4 molecules of galacturonic acid with the elimination of 4 molecules of water. . . . Thus the octa-acid is built up from 8 molecules of galacturonic acid with the elimination of 9 molecules of water. Seven of the 8 carboxyl groups of the octa-acid are methylated, the other one is free." On the basis of the assumption, adduced from the results here recorded, that 20 molecules of water are eliminated when 1 molecule of arabinose, 1 molecule of galactose, 2 molecules of acetic acid, 7 molecules of methyl alcohol, and 8 molecules of galacturonic acid combine, the empirical formula for pectin would be $C_{70}H_{98}O_{88}$; the molecular weight, 1,866.784.

The jellying power of a pectin product is attributed to the degree of polymerization of the galacturonic acid. It appeared that no single constituent of the pectin molecule is a criterion of its jellying power. "A partial removal of some of the constituents of the pectin molecule increases the jelly grade of the pectin if the octa-acid is not depolymerized. This is accompanied by a drop in viscosity, so that in this stage of hydrolysis the viscosity is not a measure of the jelly grade of a pectin. Upon further hydrolysis of the pectin the octa-acid starts to depolymerize, the degree of which may be measured by the drop in viscosity. This is accompanied by a corresponding drop in jelly grade, so that at this point the viscosity is a measure of the jelly grade." Jelly grades up to 350 could be measured by the viscosity which, in this range, varied approximately from 1 to 15. "Contrary to the general belief, the methoxyl content of pectins is not a measure of their jellying power. The jellying power of a pectin may be completely destroyed without an appreciable change in its methoxyl content. Again, the methoxyl content may be lowered to a considerable extent without any appreciable decrease in jelly power." Pectins of high jellying power, when stored even in a state of dryness, gradually decreased in jellying power.

The actual yield of furfural phloroglucide obtained from galacturonic acid by distilling with 12 percent hydrochloric acid varied with the size of sample used and required to be taken into consideration in calculating the weight of furfural phloroglucide equivalent to the galacturonic acid in the pectin for the estimation of its arabinose content. "The ratio of furfural to carbon dioxide, obtained by distilling the pectin with 12 percent hydrochloric acid, varies with the size of sample used for analysis. A variable ratio was obtained with the different pectins, indicating the presence of arabinose in the pectin molecule."

Labile sulfur in proteins, H. Zahnd and H. T. Clarke (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 171–186*).—In the case of egg albumin trials and perhaps of some other proteins, the presence of sulfur-containing components not cystine or cysteine but none the less capable of yielding their sulfur content readily as lead sulfide when they are heated with an alkaline plumbite solution, was indicated.

It was also observed that "on prolonged extraction of a neutral hydrolysate of egg white with butyl alcohol, over 70 percent of the total sulfur passes into

the alcohol. Of this sulfur about 15 percent is in a labile form; the balance is undoubtedly mainly present as methionine, but appears to include some thiolglyoxaline." The labile sulfur in the butyl alcohol extract appeared to be mainly in the disulfide or sulfhydryl form, as shown by the agreement of the labile sulfur and cystine sulfur values. "The neutral aqueous solution remaining after the extraction contains 22 percent of the sulfur originally present. About two-thirds of this exists in labile form, but concordant determinations . . . indicate that only about a quarter of the labile sulfur is present as disulfide, all of which is in the form of cystine. The major part of the nonextracted labile sulfur, amounting to one-tenth of the total sulfur in the hydrolysate, thus exists in some unrecognized form." Extraction experiments on hydrolysates containing free hydrochloric acid led to similar conclusions.

"Of particular interest is the acetone-insoluble fraction of the benzoylated hydrolysate of egg white", which was found to contain 4.7 percent of the original total sulfur. One quarter of this sulfur was of a labile variety which gave no response to the cystine-cysteine tests, and could not, therefore, have been disulfide or sulfhydryl sulfur. "The fraction in question differed markedly from those containing benzoylcystine, which is readily soluble in acetone."

Crystalline egg albumin.—The hydrolysis of crystalline egg albumin by pepsin, papain-hydrocyanic acid, and pancreatic proteinase and the subsequent action of some other enzymes on the hydrolysis products produced by these enzymes, H. O. CALVERY (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 73–89*).—The hydrolysis of crystalline egg albumin by means of pure proteinase of pancreas [pure trypsin] was studied, together with that effected by various other enzymes and by certain enzyme successions.

"The extent of the hydrolysis was determined, and it was found that one-third of the calculated number of peptide linkages was split. It was further found that the number of amino groups and the number of carboxyl groups produced were the same. Subsequent treatment with pepsin produced no further hydrolysis, while a preparation of papain-hydrocyanic acid hydrolyzed another one-third of the calculated number of peptide linkages present in the albumin.

"Protaminase following proteinase liberated 6 percent of the total nitrogen as free amino nitrogen. Aminopolypeptidase and carboxypolypeptidase carried the hydrolysis to the same end point following proteinase action or following proteinase plus protaminase. The amount of amino nitrogen liberated following their action was 60 percent of the total nitrogen. Dipeptidase further liberated 10 to 12 percent so that after complete hydrolysis by means of enzymes 75 percent of the total nitrogen was present as amino nitrogen, 72 percent of which had been liberated by enzymes. . . .

"Pepsin splits the albumin molecule to such an extent that it liberates 24 to 26 percent of the total nitrogen as amino nitrogen as estimated by the Van Slyke method or by the titration of the free carboxyl groups in 90 percent alcohol. The rate and extent of hydrolysis is the same when coagulated albumin is used as when native ablumin is used.

"When protaminase is allowed to act on the hydrolysis products by pepsin a further 7 percent of the total nitrogen is liberated as amino nitrogen. When either of the polypeptidases is used it liberates from the hydrolysis products produced by pepsin a further 24 to 25 percent of the total nitrogen as amino nitrogen, and following their action the dipeptidase present in erepsin produces a still further 24 to 25 percent of free amino nitrogen, so that the sum of the action of pepsin plus either of the polypeptidases and the dipeptidases of erepsin is the liberation of 72 to 75 percent of the total nitrogen of egg albumin as

either pancreatic proteinase or papain-hydrocyanic acid is used instead of pepsin.

"The action of papain-hydrocyanic acid is twice as extensive as that of either pancreatic proteinase or pepsin; and following its action there is no further action by either of these enzymes."

The question of the possible nature of the products set free by the various enzymes and of the number of polypeptide linkages probably broken is concisely analyzed in a short discussion.

Studies of the peptides of trivalent amino acids.—III, The apparent dissociation constants, free energy changes, and heats of ionization of peptides involving arginine, histidine, lysine, tyrosine, and aspartic and glutamic acids, and the behavior of lysine peptides toward nitrous acid, J. P. GREENSTEIN (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 603–621, fig. 1*).—The present installment of this serial contribution (E.S.R., 69, p. 5) from the University of California Medical School reports determinations of the apparent dissociation constants at 0° and at 25° C. of phenylalanylarginine, tyrosylarginine, aspartyltyrosine, histidylglycine, phenylalanylglycine, glycylglycine, lysylglutamic acid, and lysyllysine, together with calculated values of free energy changes and heats of ionization.

The heat of ionization of the carboxyl group was found negligible; those of the amino and guanidine groups considerable (of the order of 10,000 to 12,000 calories); those of the imidazole and oxyphenyl radicals of intermediate magnitudes.

"The change in free energy due to ionization corresponding to the carboxyl group is slightly greater in the peptides than in the amino acids, and possesses an appreciable temperature coefficient. On the other hand, the free energy change of the amino groups in the peptides is considerably less than that of the same group in the amino acids, and its value is practically independent of the temperature."

In the transition of amino acids to peptides the amino and carboxyl groups were found to be considerably weakened. This weakening was observed to be subject to modification by the presence of various groups, such as the imidazole and oxyphenyl rings, and guanidine nucleus. "A concentration of basic groups as in lysyllysine may even more than overcome the weakening influence of the peptide linkage, and cause the carboxyl group to dissociate at a reaction more acid than in lysine itself."

The titration constants of glycylproline at 25° were determined and are compared with those of glycylglycine.

The rates of deamination of lysine, lysyllysine, lysylglutamic acid, and lysylhistidine by nitrous acid were determined. Lysine required approximately 15 min. for complete deamination; the lysylpeptides, about half this time.

On a dipeptide phosphoric acid isolated from casein, P. A. LEVENE and D. W. HILL (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 711–718*).—The phosphopeptone obtained from the tryptic digestion products of casein yielded, on hydrolysis in 2 N hydrochloric acid, an acid precipitable as its barium salt. Fractionation of the barium salt failing to produce the desired purification, isolation of the brucine salt was tried and permitted the isolation of a glutamylserinephosphate of that base.

Studies on digestibility of proteins in vitro.—V, Rate of liberation of cystine on hydrolysis of casein. Some observations on colorimetric tests for cystine when applied to peptic and acid digests of casein, D. B. JONES and C. E. F. GERSDORFF (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 657–667, fig. 1*).—The authors of this contribution from the Bureau of Chemistry and

protein digestibility in vitro to the series initiated by Waterman and Johns (E.S.R., 45, p. 763).

Cystine was shown to be liberated, in part, in the early stages of the hydrolysis of casein with 20 percent hydrochloric acid. After the first 30 min., 20 percent of the cystine content of the casein was found to have been set free; after 3.5 hr., 50 percent. No further increase was observed after 6 hr.

Peptic digestion did not liberate cystine in detectable quantities. Color values obtained by some of the colorimetric methods, increasing to a maximum and then falling off at later stages of the digestion, "are produced by some compound or compounds other than cystine, or by certain reactive groups in the casein which are exposed during the initial stages of proteolysis." At least two factors appeared to be involved.

The racemization and oxidation of cystine in acid solution, J. C. ANDREWS (*Jour. Biol. Chem., 102 (1933), No. 1, pp 263–268*).—The oxidation of cystine in hydrochloric acid solution to cysteic acid by means of free oxygen was found to be much accelerated by the presence of copper salts; but copper was entirely ineffective in promoting this oxidation when sulfuric or phosphoric acid was used as solvent for the cystine. In these acids no appreciable amount of oxidation appeared in any case. All other substances tested for catalytic activity in this reaction (ferrous and ferric salts, blood, and hydroquinone) were shown to be ineffective. Phosphoric acid caused much more rapid racemization of cystine than did either sulfuric acid or hydrochloric acid. The curve of optical activity v. degree of neutralization of cysteic acid was determined.

The decomposition of cystine phenylhydantoin, J. C. and K. C. ANDREWS (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 253–262*).—The authors found the mode of decomposition of cystine phenylhydantoin in both acid and alkali to correspond to that of serine phenylhydantoin. "Alkaline decomposition of cystine phenylhydantoin produces sodium sulfide, free sulfur, and 3-phenyl-5-methylene hydantoin, the latter easily decomposing to form pyruvic acid and phenylurea. Mild alkaline decomposition at room temperature produces no ammonia. The solubility of cystine phenylhydantoin in water and in hydrochloric acid at various temperatures has been determined. The preparation and some properties of cysteic acid phenylhydantoin hydrobromide are described. The compound is very unstable and gives, as one of its decomposition products, inorganic sulfate."

The isolation and characterization of mesocystine, H. S. LORING and V. DU VIGNEAUD (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 287–295, figs. 8*).—The authors describe the isolation of the internally compensated stereoisomer of cystine, mesocystine, and offer evidence in support of the postulated stereo structure of the compound. The isolation of *dl*-cystine is also described, together with the preparation of various derivatives of the two optically inactive isomers of cystine.

The preparation of glycyltaurine and glycylcysteic acid, J. WHITE (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 249–251*).—The author concisely records synthetic methods, yields, and certain of the properties of the products obtained, noting that "the behavior of peptides of this type is of particular interest, since in the bile acids containing taurine the amino group of the taurine is combined and is not liberated until after hydrolysis."

The chemistry of the lipids of yeast.—I, The composition of the acetone-soluble fat. II, The composition of the phospholipids, M. S. NEWMAN and R. J. ANDERSON (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 219–228; 229–235*).—The authors extracted, in the experiments reported upon in the first

paper, fresh living yeast with alcohol and ether to obtain lipids amounting to 6.02 percent calculated on the dried yeast as a basis. Further extraction of the partly defatted cells with alcohol containing 1 percent of hydrochloric acid yielded material amounting to 0.86 percent calculated on dry yeast. The alcohol-ether-soluble lipids were separated into phospholipids, acetone-insoluble fat, and acetone-soluble fat.

The acetone-soluble fat having been saponified, the following substances were obtained: "Sterols, a mixture of saturated cyclic and bicyclic hydrocarbons ranging from $C_{19}H_{38}$ to $C_{34}H_{66}$ present as an impurity in the yeast used, glycerol, and fatty acids. The saturated acids consisted of about 75 percent of palmitic and 25 percent of stearic acid, together with a trace of some acid lower than palmitic acid." The unsaturated acids, on catalytic reduction, gave a mixture of about 25 percent of palmitic with 75 percent of stearic acid.

No appreciable quantity of an acid higher than stearic acid was found in the acetone-insoluble fat or in the fat obtained by extraction of the yeast cells with alcohol containing 1 percent of hydrochloric acid.

The second paper reports upon an hydrolysis of the phospholipids of yeast and a detailed study of the cleavage products. Glycerophosphoric acid, choline, and aminoethanol were identified among the water-soluble constituents. The saturated fatty acids consisted of about equal parts of palmitic and stearic acids. The unsaturated acids on catalytic reduction yielded a mixture of about 60 percent of palmitic acid and 40 percent of stearic acid, together with a trace of lauric acid.

The oxidation of theelin and some theelol derivatives, D. W. MacCorquodale, L. Levin, S. A. Thayer, and E. A. Doisy (*Jour. Biol. Chem., 101 (1933), No. 3, pp. 753–761, fig. 1*).—The authors report quantitative investigations into the permanganate oxidation of theelin, of theelol, and of some of the derivatives, in extension of their earlier work (E.S.R., 69, p. 484).

"In all cases, except that of theelin methyl ether, the extent of the reaction was found to vary with the temperature and with the concentration of the permanganate. Methylation of the phenolic hydroxyl group in theelol and theelin stabilizes the aromatic nucleus against oxidation; reduction of theelin to the desoxo compound does not stabilize the ring which in theelin bears the carbonyl group. No difference was found in the oxygen equivalents of theelin from human urine and theelin from mare urine. Oxidation of theelol methyl ether with potassium permanganate in acetone solution produces a methoxy lactone of the formula $C_{18}H_{22}O_3$ and an acid, $C_{19}H_{24}O_5$ identical with the methyl ether of the acid obtained by potash fusion of theelol. By oxidation of the acid $C_{19}H_{24}O_5$ with aqueous permanganate an acid was obtained with the probable formula $C_{19}H_{22}O_8$. By the oxidation of the acid $C_{19}H_{24}O_5$ with chromic acid a methoxy dilactone of the formula $C_{18}H_{18}O_6$ was obtained. Fusion of theelin with potassium hydroxide produces a phenolic monobasic acid, $C_{17}H_{22}O_3$. Theelin from mare urine and that from human urine give the same substance. These oxidation products have several times the estrogenic potency of theelin."

The determination of thyroxine in the thyroid gland, N. F. Blau (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 269–278*).—The author presents a method for the quantitative extraction of thyroxine from alkaline hydrolysates of thyroid substance. The procedure depends upon the insolubility of thyroxine in an acid solution and upon the pronounced solubility of the acid salt of the product in butyl alcohol.

The action of light on fats, C. H. Lea (*Jour. Soc. Chem. Indus., Trans., 52 (1933), No. 21, pp. 146T–149T, figs. 6*).—This is a general discussion of the subject, with several references to recent literature. Calling attention in

conclusion to the fact that ultraviolet and visible light both greatly accelerate the oxidation of fats and that in the visible spectrum the light in the yellow-orange region at about 6,000–6,500 a.u. is the most active and the green between 5,000 and 5,500, the author emphasizes the importance in the selection of colored wrappers to protect foodstuffs from photochemical oxidation of determining the light transmission curve by means of a spectrophotometer in order to insure that the most active wave lengths are really cut out.

Recent developments in pharmacopoeial vitamin standardization, E. F. Cook (*Amer. Jour. Pharm., 105 (1933), No. 12, pp. 583–587*).—A brief history is given of the development of the U.S.P. standards for cod-liver oil with the relationship between various units which are in use for vitamins A and D. According to the author, "one U.S.P. X Sherman [U.S.P., tenth edition] or A.D.M.A. [American Drug Manufacturers' Association] unit of vitamin A equals 1.4 international or new U.S.P. units. One Steenbock unit of vitamin D equals 2.7 international or new U.S.P. units. One international or U.S.P. unit of vitamin D equals 3.25 A.D.M.A. units."

Crystalline antineuritic vitamin (B_1) obtained with the aid of picrolonic acid, A. Seidell and M. I. Smith (*Jour. Amer. Chem. Soc., 55 (1933), No. 8, pp. 3380–3383*).—In continuation of the authors' attempts to isolate the antineuritic vitamin (B_1) in crystalline form (E.S.R., 65, p. 805), success has been achieved with picrolonic acid applied to the acetone precipitated concentrate of an activity of about 0.1 mg, as determined by the rat method previously described (E.S.R., 63, p. 291). Although the crystalline product has been isolated repeatedly, the yield is very low, the highest recovery thus far obtained being approximately 25 percent. The procedure is described in detail, and the various steps are summarized as follows:

"Vitamin concentrate prepared from brewers' yeast by adsorption on fuller's earth followed by extraction, benzoylation, and acetone precipitation, as previously described, when dissolved in water and treated with an alcoholic solution of picrolonic acid yields initial precipitates which are relatively inactive. The filtrate from these when evaporated yields a semicrystalline deposit rich in the antineuritic vitamin. This picrolonate deposit when purified by recrystallization from methyl alcohol is converted to characteristic rods or prisms which are curative for polyneuritic rats in doses of 0.015 mg."

In comparison with this figure the minimum curative doses of vitamin hydrochloride crystals sent to the authors by Jansen, Windaus, and Peters were found to vary between 0.008 and 0.012 mg. Inasmuch as the picrolonate has been calculated to contain approximately 35 percent and the hydrochloride 80 percent of the vitamin base, it is estimated that the curative dose of picrolonate should be about twice that of the hydrochloride. "Since the curative dose of our picrolonate is 0.015 mg as compared with 0.008 mg as the minimum curative dose of the best of the three hydrochlorides submitted to us, it is evident that the crystals obtained directly by means of picrolonic acid as herein described are equally as pure as those obtained by the transformation of other vitamin salts into the picrolonate."

Physiological properties of the vitamins, R. R. Williams and W. H. Eddy (*Carnegie Inst. Wash. Yearbook, 32 (1932–33), pp. 319–322*).—This progress report (E.S.R., 69, p. 148) includes a critical review of reports on the attempted isolation of vitamin B_1, including the work of Kinnersley, O'Brien, and Peters (E.S.R., 70, p. 153), Jansen et al. (E.S.R., 70, p. 741), Van Veen (E.S.R., 65, p. 311), and Seidell and Smith (noted above), and a description of the various steps in the authors' method by means of which crystals have been obtained at least as active as those of other workers.

The method consists essentially in extracting the vitamin from fuller's earth with acid quinine sulfate solution, clearing with barium hydroxide and helianthin, and precipitating the vitamin with silver nitrate at pH 4.5 and 7.5. The silver precipitate is then decomposed with HCl, the solution benzoylated in the presence of excess $NaHCO_3$, and, after removal of the benzoylated byproducts, acidified and precipitated with phosphotungstic acid at pH 5.1. The precipitate is refractionated with purified phosphotungstic acid, clarified with alcohol, and finally precipitated with gold chloride. The gold precipitate is decomposed with freshly precipitated silver, the resulting solution evaporated to dryness, taken up in strong alcohol, and crystallized directly from the alcoholic solution, or after the further addition of petroleum ether.

The best yields obtained have corresponded to 250–300 mg of hydrochloride from 50 kg of rice polish. The melting point of the hydrochloride after one recrystallization ranges from 247° to 251° C. corrected. In curative tests on rats, using the method of Smith (E.S.R., 63, p. 291), cures for 10 days have been produced on a dosage of 0.00375 mg.

A color reaction for carotene, V. E. Levine and G. E. Bien (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, pp. 581, 582*).—The sensitive test for carotene described depends upon the fact that carotene in chloroform solution reacts with formaldehyde in sulfuric acid to form between the chloroform and acid layers a characteristic deep violet zone which on shaking disseminates in the acid, giving a violet-colored lower layer. If carotene is present in high concentration, the addition of 2 or 3 drops of acetic anhydride causes a transitory blue color to appear in the acid layer.

Directions are given for carrying out the test, and attention is called to a similar but less sensitive reaction with a different color between cholesterol and the formaldehyde sulfuric acid reagent.

The quantitative microanalysis of plant juice for reducing sugars and sucrose, F. S. Schlenker (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 29–34, fig. 1*).—The authors of this contribution from the Rhode Island Experiment Station showed that a slight excess of a saturated neutral lead acetate solution was sufficient to precipitate the coloring matter and proteins from juices obtained by enclosing samples of the plant material tightly in cheesecloth, freezing with a stream of carbon dioxide, allowing the excess carbon dioxide to escape from the sample, and then expressing the juice by means of a hydraulic press. The excess lead could be taken out of the solution by adding disodium phosphate. To show the effect of these reagents on a sugar solution, determinations were made by all the sugar methods employed. The recoveries were between 96.25 and 101 percent for both glucose and sucroce. No appreciable loss, therefore, occurred during clarification.

It was shown that for the determination proper a method dependent upon the reduction of an alkaline copper tartrate solution gives the best results, because its sensitiveness to certain nonsugar components which cannot be removed from the juice is less than that of ferricyanide and other reagents investigated. It was shown also that the substances which interfered with the more sensitive reactions are not the sugar reagent-reducing amino acids, amino acids having been shown to have been removed from the juice in the clarification treatment.

A note on the determination of lactic and pyruvic acids, W. B. Wendel (*Jour. Biol. Chem., 102 (1933), No. 1, pp. 47–50, fig. 1*).—"With a resting blood lactate level of 10 mg percent, the filtrate representing 0.5 cc of blood (0.05 mg of lactic acid) yields a titration of only 0.22 cc of 0.005 N I_2. Without special precautions the blank on reagents with the usual apparatus [of Friedmann et al. (E.S.R., 58, p. 114)] and room air often amounts to half this quantity.

With a modified apparatus and purified reagents the blank may be reduced to about 0.02 cc, thus permitting analysis with amounts of blood filtrate representing 0.5 to 1.0 cc of blood."

A drawing indicates the nature and dimensions of the modified form of apparatus used, and the procedure is given in working detail.

AGRICULTURAL METEOROLOGY

The importance of phenology for agriculture [trans. title], J. D. Koeslag (*Landbouwk. Tijdschr.* [*Amsterdam*], *46* (*1934*), *No. 558, pp. 230–241, figs. 2*).—The more important relationships of phenology to agriculture and its possibilities in this respect are briefly reviewed.

Influence of weather on wheat growth (*Northwest. Miller and Amer. Baker, 11* (*1934*), *No. 3, p. 600*).—Attention is called briefly to a study of the influence of weather on wheat growth by J. W. Hopkins, of the National Research Council of Canada, which it is stated "reveals that rainfall in the early part of the growing season results in the highest yields, the first 30 days after seeding being the most beneficial period for rains. From 30 to 90 days after seeding, the beneficial effect, as measured by the increase in yield due to each additional inch of rain, shows a progressive diminution. Rain falling in the period 95 to 110 days after seeding seems to be definitely detrimental. Higher than average temperatures at the time of seeding and during the first month of the growing season are associated with higher yields. During the period 30 to 85 days after seeding, however, high temperatures appear to be unfavorable, the maximum detrimental effect being experienced approximately 60 days after seeding."

The meteorological factors of soil freezing and the role of frost lines in freezing injury [trans. title], E. Ijjász (*Időjárás* (*Weather*), *37* (*1933*), *No. 9–10, pp. 141–150, figs. 5; Ger. abs., pp. 180, 181*).—This is a preliminary account of the use of a special apparatus and method for measuring the process of freezing and thawing in soils and the position of frost lines under different conditions of moisture, physical condition, and cover. It was found that the factors of most direct importance were temperature and liquid water in the soil. Freezing was observed to proceed from the top downward, but thawing proceeded both upward and downward. The rate of freezing was 64 percent greater in spaded soil than in that covered with grass. The two frost lines, the upper and the lower, were found to play a large part in freezing injury to roots of plants, depending upon whether the lower line was above or below the root zone.

Temperature of the air near the ground [trans. title], C. E. Brazier and L. Éblé (*Compt. Rend. Acad. Sci.* [*Paris*], *197* (*1933*), *No. 25, pp. 1678–1680; abs. in Sci. Abs., Sect. A—Phys., 37* (*1934*), *No. 434, p. 131*).—This article describes and reports results obtained with a so-called aspiration apparatus which appeared to give more accurate measurements of the temperature of the air near the ground than were obtained with an ordinary unprotected thermometer, the errors of which are pointed out. In the apparatus referred to the thermometer was protected by a tube through which air was drawn from a point 3 cm above the ground.

Climatological summary for Wooster and Ohio for year 1982, C. A. Patton (*Ohio Sta. Bul. 532* (*1934*), *pp. 106–111*).—Data for temperature, precipitation and length of the growing season at the experiment station, Wooster, and for the State at large, for 1982, are summarized as for previous years.

Climatological observations [trans. title], P. Poskin and R. Bercé (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 3* (*1934*), *No. 1, pp. 10–31, figs. 5; Flem.,*

Ger., Eng. abs., pp. 30, 31).—Attention is called to the establishment in 1932, at the Agronomic Institute at Gembloux, of a meteorological station which is to record and interpret, particularly from the agricultural standpoint, observations on solar radiation, including sunshine and total solar radiation, direct and diffused; temperature under shelter, on the ground level, and 10 cm above the ground level; and precipitation, evaporation, and humidity. Records for 1933 as a whole and by months and seasons are reported.

SOILS—FERTILIZERS

[Soil investigations of the Ohio Station] (*Ohio Sta. Bul. 532* (*1934*), *pp. 18–22, figs. 2*).—The report includes concise summaries by E. E. Barnes on the effect of soil reaction on the availability of phosphate fertilizers, by R. Bradfield on the effect of lime and neutral calcium salts on the solubility of soil potassium, by G. W. Conrey on the soil survey of Logan County, and by G. M. McClure on the movement of fertilizer salts in soils.

[Soil investigations in Rhode Island] (*Rhode Island Sta. Rpt.* [*1933*], *pp. 60, 70, 71, 85–89*).—Data are reported on soil acidity and liming, in which treatment of a soil of high lime content with manganese increased table beet yield by 238 percent; and experiments on the availability of certain phosphates, of which potassium metaphosphate and magnesium phosphate were shown to have the best availability. The report contains also articles on the value of a rapid chemical method for determining readily available phosphorus in Rhode Island soils, by J. B. Smith and W. L. Adams; and on starfish and certain unusual organic nitrogen carriers, by B. E. Gilbert and F. R. Pember.

The effects of mulched and turned rye in the green and mature stages on the liberation of plant nutrients from a silt loam soil, H. H. Hill (*Virginia Sta. Tech. Bul. 53* (*1934*), *pp. 18*).—Results of a 4-year study of the effects produced by immature and mature rye, mulched and turned, on the leaching of plant nutrients from silt loam soil samples in 14 lysimeters are given.

"Nitrification was active in the soil of the mulched and turned tanks which had received a treatment of green rye. Where mature rye was applied as a mulch or turned into the soil, a depressing effect was observed. Where organic matter was applied as a surface mulch the first rainfall gave leachings, while those tanks which had organic matter turned into the soil gave no leachings. It was only after 13.28 in. of rainfall had been recorded that the tanks which had the organic matter incorporated with the soil gave leachings. Throughout the entire 4-year period the amount of water leached from the mulched series of tanks was greater than that collected from the turned series. Determinations of the pH value of the leachings proved them to be either neutral or very slightly alkaline in the large majority of cases. In only a few instances was the soil solution below the neutral point. Nitrate recovery was greatest the first year of the investigation with the tanks which had organic matter incorporated with the soil. After this, the mulched series of tanks gave the greatest outgo. The 4-year totals show the greatest gain for the mulched and turned green rye. Small gains were made for the mature rye mulched and turned, but there appeared to be a depressing effect on account of the wide nitrogen-carbon ratio of the material.

"Calcium was present in the leachings in large amounts. The leachings of the first year contained the largest amount. With the mature material the gain in calcium was not so large, but positive in every case when compared with the control tanks. The magnesium concentrations were also very high the first year of the investigation. After this the outgo was more normal. Sulfur

was increased in the leachings by the addition of the several forms of organic matter. Potassium was greatest the first year for all treatments, including the controls."

Longevity of Rhizobium japonicum in relation to its symbiont on the soil, J. K. WILSON (*[New York] Cornell Sta. Mem. 162 (1934), pp. 11*).—Soil samples were collected from more than 50 plats on the university farms on which soybeans had at some time been grown, though not on one of the plats for 25 yr., while on some of the other plats they were growing when the samples were taken. "The number of *R. japonicum* in these samples was determined by the biological method. The presence of nodules on the plants grown where a certain portion of 1 g of the soil was used served to indicate the presence, and thus the number, of the root-nodule bacteria in the sample.

"Although a growing crop may liberate in the soil a very large bacteria population when the nodular tissue decomposes, this population is transitory and probably does not exist for as long a period as 1 yr. The root-nodule bacteria dwindle almost to extinction in certain cases, for soybean plants grown on 300 g of soil from some fields where well-nodulated soybeans had grown failed to bear nodules. There were no more root-nodule bacteria for soybeans in the soil of certain plats that had grown soybeans as recently as 2 or 3 yr. than in the soil from plats that had not grown soybeans for 20 or 25 yr."

The aerobic cellulose decomposition in irrigated fields [trans. title], L. RUBENTSCHIK (*Zentbl. Bakt. [etc.], 2. Abt., 88 (1933), No. 8–12, pp. 186–193*).—Soils of irrigated fields were found to contain large numbers of cellulose-decomposing aerobes, among which representatives of the genera *Cytophaga*, *Cellvibrio*, and *Cellfalcicula* were especially abundant, as were also *Actinomyces krainskyi* and various molds.

Of various methods used, all indicated the presence of essentially the same groups of organisms; but the clearest picture of the cellulose-decomposing activities, both from the microbiological and from the biochemical standpoint, was given by the Winogradsky method (E.S.R., 54, p. 119).

The morphology of the organisms of the genus *Cytophaga* corresponded with Winogradsky's descriptions. Aerobic cellulose decomposition in the irrigated soils studied gave rise to substances of the nature of humic acids.

Corynebacteria as an important group of soil microorganisms, H. L. JENSEN (*Linn. Soc. N.S.Wales, Proc., 58 (1933), pt. 3–4, pp. 181–185*).—Bacteria possessing the characters of the genus *Corynebacterium* were found to occur as a numerically important group of micro-organisms in Australian soils, accounting for from 8 to 65 percent of the numbers of bacterial colonies developing on plates of dextrose-casein-agar. They appeared active in the decomposition of organic matter in soil, particularly in the later stages of the process. "They are probably identical with certain organisms previously recorded as rhizobia."

Microbes test soil, S. A. WAKSMAN and R. L. STARKEY (*N.J. Agr., 16, (1934), No. 2, pp. 7, 8*).—This article is a brief popular discussion of the use of *Azotobacter*, in the soil plate method (E.S.R., 66, p. 616), and of such molds as *Aspergillus niger* for estimating potassium and phosphorus needs.

"These methods seem to fulfill many of the requirements necessary for procedures which are to find wide application in studies of agricultural soils. They are simple and inexpensive and lend themselves readily to various modifications. They are of course not infallible and require careful operation under accurately controlled conditions for most effective use."

Suitable fertilizer mixtures for different crops, including the functions of chief plant nutrients, H. B. MANN and W. H. RANKIN (*North Carolina Sta. Agron. Inform. Circ. 86 (1934), pp.* [1]+[12]).—The circular lists "suitable fertilizer mixtures, each for cotton, corn, small grains, grasses, tobacco, irish potatoes, adapted vegetables, melons, legumes, sweetpotatoes, and strawberries when grown on soils of average fertility in the three main soil provinces of the State."

Registration, labeling, and inspection of commercial fertilizers, 1933, F. B. MUMFORD, W. S. RITCHIE, L. D. HAIGH, and E. W. COWAN (*Missouri Sta. Bul. 333 (1934), pp. 30*).—The bulletin contains the usual analytical data, inspection report, and advice to fertilizer purchasers (E.S.R., 69, p. 187).

AGRICULTURAL BOTANY

[Contributions to agricultural botany in Florida] (In *Fla. State Hort. Soc. Proc., 44 (1931), pp. 61, 62; 45 (1932), pp. 13–20*).—Contributions presented at these annual meetings included for 1931 Sun Rays and Plant Life, by O. Sieplein, and for 1932 The Role of the Less Common Elements in Plant Life, by R. V. Allison.

Developmental anatomy and homologies in wheat, M. A. MCCALL (*Jour. Agr. Res.* [*U.S.*], *48 (1934), No. 4, pp. 283–321, pls. 2, figs. 14*).—In this contribution from the U.S.D.A. Bureau of Plant Industry a comparison of vascular elements and the origins and placement of nodes, leaves, buds, and roots in the young wheat plant and in the embryo shows similar relationships and leads to the following conclusions:

The epiblast is interpreted to be a vestigial leaf because of its association with a cross-axis vascular plate and root origins and its alternate distichous position with reference to the next succeeding leaf. "It is without vascular connection because of its position at the first node, below which is root tissue, in which leaf traces do not originate.

"Immediately above the first node is a short internode with enclosing procambial cylinder and central pith parenchyma. Terminating this internode is a cross-axis procambial plate, the second node of the embryo. Immediately under this nodal plate the scutellum trace begins to diverge from the axis. Roots take origin above the nodal plate. Because of its association with nodal plate and root origin and the divergence of its trace from the axis below the nodal plate, as with any other leaf, the scutellum is interpreted as a leaf, the functional cotyledon, divergent from the second node.

"Above the second node is a second internode terminated by a third cross-axis vascular structure. Associated with this structure are the divergence of the coleoptile and root and axillary-bud origins above the coleoptile divergence. This region is, therefore, interpreted as the third node of the young plant, and the coleoptile as a third leaf. Because of its similarity to the prophylls in function, position with reference to a plumule, outward appearance, and vascular anatomy and connections, the coleoptile also is interpreted as the homologue of the prophyll.

"The higher attachment of the coleoptile on that side of the axis toward the scutellum, the vascular relationships of the coleoptile in *Triticum vulgare* and *T. dicoccum*, and Hanstein's observations on the origin of the coleoptile in *Brachypodium* as two opposite projections that later merge into the coleoptile ring suggest that the coleoptile may represent the evolutionary equivalent of two leaves. In such a case the third node would represent two nodes. If correct, this explains the position of the bud in the axil of the coleoptile on

the same side of the axis as the scutellum, when the phyllotaxy of the Gramineae would seem to require it to be on the opposite side. The evidence in support of this hypothesis is considered only suggestive.

"The structure of Van Tieghem's three types of grass embryos as exemplified by *Avena*, *Zea*, and *Triticum* is interpreted as being fundamentally similar. In all three the scutellum diverges from the second node and the coleoptile from the third node. The difference between the three lies in the internode location of important intercalary growth during seedling development. In *Avena* this important growth occurs in the first internode, in *Zea* in the second internode, and in *Triticum* in the third internode. The location of intercalary growth in these three embryo types is considered in itself as identifying the internodes and confirming the interpretation of the embryo herein presented.

"Embryo and seedling anatomy in the Gramineae does not justify the term 'mesocotyl.' The structure called mesocotyl in *Avena* is hypocotyl, while that called mesocotyl in *Zea* is epicotyl. The term 'mesocotyl' should be abandoned and the correct terms used instead.

"Seedling morphology and developmental sequence are determined in large part by vascular anatomy. The primary root, the coleoptile and plumule, and the first foliage leaf are most favorably situated from a vascular standpoint to use food material stored in the endosperm. The first pair of lateral seminal roots also is favorably situated, while the second lateral pair of seminal roots, the face seminal root, and the coleoptile axillary bud are each successively less well situated to use food materials stored in the endosperm.

"The primary root system, because of its direct connection with the primary axis, is most effective in absorbing soil nutrients and conducting them to the crown of the plant. Unless destroyed by disease or in some other way, the roots of this system, the seminal roots, remain functional during the life of the plant."

On the question of the transport of the growth hormone in the coleoptile of oats [trans. title], F. Laibach and P. Kornmann (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 21 (1933), No. 3, pp. 396–418, figs. 14*).—Growth hormone from orchid pollinia, when applied to one side of the coleoptile by means of agar blocks or strips, produced marked curvature by the resultant unilateral stimulus to growth, both in decapitated and normal seedlings. Stimulus is most marked when the hormone agar is applied midway between base and tip. The effect of longitudinal agar strips is speedier and less localized than of agar blocks. The hormone does not appear to be transported apically from the agar, nor does the application of agar need to be continuous. Reaction increases with hormone concentration only to a certain point, then falls off. The narrow edge of the coleoptile reacts more strongly than the broadside, and while absorption takes place through the epidermis the pathway of translocation is not certain.—(*Courtesy Biol. Abs.*)

Catalase, peroxidase, and respiration in the germination of light-sensitive seeds of Nicotiana tabacum [trans. title], F. Schröppel (*Bot. Centbl., Beihefte, 51 (1933), 1. Abt., No. 2, pp. 377–407, figs. 16*).—In the dark the respiration of *N. tabacum* seeds increased with swelling. As swelling ceased the respiration rate gradually fell to slightly less than the original. In the light, respiration increased gradually the first 10 hr. A slight decrease for the next 6 hr. was followed by a second increase, which became marked after 30 hr. and continued up to 45 hr., when the experiment was terminated. The first 10 hr. the respiratory quotient rose slightly and remained steady up to 30 hr., after which there was a gradual decrease. Seeds exposed to light in pure O_2 checked the CO_2 output, causing a steady drop in the respiratory

quotient. In an O_2 free atmosphere there was very little respiration. In the dark, catalase activity increased gradually to a maximum at 30 hr., 20 hr. later than the respiratory maximum for the seeds. The very weakly active peroxidase began to decrease after 40 hr. In the light there was a marked increase in catalase activity after 37 hr. and in peroxidase activity after 52 hr.

The author did not find a direct correlation between light effects and respiration or enzyme activity.—(*Courtesy Biol. Abs.*)

The determination of the intensity of photosynthesis [trans. title], P. B. Jensen (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 21 (1933), No. 3, pp. 368–380, figs. 3*).—This paper is devoted largely to a description of apparatus and refinement in technic for determining CO_2 assimilated by detached leaves. The leaves were maintained under constant conditions as to CO_2 supply, light (electric), and temperature (20° C.). The number of milligrams of CO_2 assimilated by the leaves of *Sinapsis alba* per 50 cm^2 (one surface only) per hour at 20° varied from 0 with no "lux" to 10.8 with 17,000 lux. Stomatal opening measurements are also given in connection with the results.—(*Courtesy Biol. Abs.*)

Elucidation of the concept of transpiration resistance [trans. title], A. Seybold (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 21 (1933), No. 3, pp. 353–367, fig 1*).—Transpiration resistance cannot, as hoped earlier, be determined for a given plant under fixed conditions in such a way that predictions for changed conditions are valid. Transpiration resistance in different plants is comparable only as obtained under identical conditions. The physical and physiological factors underlying this situation are discussed.—(*Courtesy Biol. Abs.*)

Suction-pressure gradients and the measurement of suction pressure, E. C. M. Ernest (*Ann. Bot. [London], 45 (1931), No. 180, pp. 717–731*).—The results given by the method of Ursprung and Blum for measuring the suction pressure of plant cells in sections are entirely vitiated by an experimentally introduced factor. The wounding of many cells, unavoidable in the preparation of a section, liberates cell contents which act osmotically on the uninjured cells. The suction pressure of palisade cells stripped out from the leaves of *Crocus* without injury was some 30 percent lower than that of similar cells in sections. This factor being eliminated, no evidence was obtained of the maintenance of suction pressure gradients and differences in excised pieces of plant tissue.—(*Courtesy Biol. Abs.*)

Studies in the suction pressure of plant cells, II, E. C. M. Ernest (*Ann. Bot. [London], 48 (1934), No. 189, pp. 293–305, fig. 1*).—"For the method of suction pressure measurement already described some points of detail are elaborated. The effect of immersion in paraffin of portions of an *Iris* leaf is studied. There is a small initial rise during the first 5 min. The suction pressure of the superficial mesophyll cells of leaves of *Iris* is shown to maintain a remarkably constant value in the plant, changing little during the 24 hr. In excerpted tissues the suction pressure shows a response to varying experimental conditions, such as light and atmospheric humidity. An indication is obtained of a slight gradient of suction pressure across the cells of *Iris* leaves, i. e., from the water-conducting tissue to the surface tissues. A small increase in suction pressure with the height of insertion of the leaves of *Ampelopsis veitchii* is demonstrated."

GENETICS

What is a gene? M. Demerec (*Jour. Heredity, 24 (1933), No. 10, pp. 369–378, figs. 4*).—The conception of genes is visualized "as single organic molecules.

The gene string, then, gives us an interesting picture of a group of molecules held together by some unknown force in a string, each molecule possessing a power of self-propagation, and each one individually and all of them together having an almost magic power of governing life processes of cells in which they are located, and therefore of governing life processes of the organism of which these cells are an integral part."

An annotated list of groups of wild hybrids in the New Zealand flora, L. Cockayne and H. H. Allan (*Ann. Bot. [London], 48 (1934), No. 189, pp. 1–55*).—Of the 491 groups listed, 396 are considered as established beyond reasonable doubt. Of these, 6 are intergeneric crosses, the remainder being distributed among 45 families and 92 genera, involving 478 species, or over 20 percent of the flora as it is at present delimited. Very many of the groups are extremely polymorphic and show considerable fertility in the hybrid progeny. In certain groups characters not observed in the parents appear in the progeny, and in certain swarms, especially in *Hebe* and *Leptospermum*, the parents appear to be swamped by the offspring. Large genera especially rich in hybrid groups are *Acaena*, *Aciphylla*, *Asplenium*, *Carex*, *Celmisia*, *Coprosma*, *Dracophyllum*, *Epilobium*, *Gentiana*, *Hebe*, *Olearia*, *Ranunculus*, and *Uncinia*, whereas hybrids appear to be comparatively rare in the *Cruciferae* and more or less sterile in *Rubus*.

Maize crossing values in second-generation lines, R. L. Davis (*Jour. Agr. Res. [U.S.], 48 (1934), No. 4, pp. 339–357, figs. 2*).—Lines of corn inbred two generations from the three highest yielding parent ears of corn selected from the Lajas, Penuelas, and Jayuya districts in Puerto Rico in 1923 were compared in yield and plant characters and were crossed with Yauco-Torre, an unrelated open pollinated corn.

In 1927 yield trials at the Puerto Rico Experiment Station, the 27 line-variety hybrids as a group significantly outyielded Yauco-Torre corn. Castillear–1–5–1 × Yauco-Torre was significantly superior to other hybrids. A parallel performance was observed in 5 of 6 groups of sib line-variety hybrids, they being either all high yielding or low yielding. Correlations determined between line-variety yields and various characters of inbred parents indicated that within the material studied the average yield of the first and second inbred generations was the most dependable basis for elimination.

When five parent ears from five different districts were selected for high total longisection area of ears per plant and self-pollinated, and yield trials in 1928 compared hybrids between second inbred generation derivatives of these ears and a line (assumed as recessive) selfed three times the line-recessive hybrid yields were not as superior to the Yauco-Torre check as were those of the line-variety hybrids. Parallel performance was noted among hybrids from four groups of second-generation sibs. Both plant height and total longisection area of ears per plant of the yellow-kerneled inbred lines appeared dependable as a basis for elimination in the second inbred generation.

Yields significantly superior to Yauco-Torre corn were obtained from four sib lines derived from Castillear–1–o.p–50 by outcrossing them in the second inbred generation with a third-generation line. In 1931 line-variety crosses between the composites, Castillear–1–5–1 or Castillear–1–5–2 and a number of native varieties outyielded corn grown on a Utuado district farm. These lines gave superior yields in the second inbred generation outcrossed with open-pollinated native field corn and continued to do so after the fourth to fifth inbred generation. However, the margin of superiority did not appear to have been increased by additional generations of inbreeding prior to crossing.

Heterosis or hybrid vigor in oats, F. A. COFFMAN and L. L. DAVIS (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 318–327, figs. 3*).—Additional data are presented on characters discussed in an earlier (E.S.R., 64, p. 429) contribution from the U.S. Department of Agriculture cooperating with the Idaho Experiment Station, and also on size of crossed seeds and of F_1 plants in oats, seed vigor of F_1 plants as measured by germination, and heterosis in different plant parts.

An immediate increase in kernel weight appeared to result from hybridization in oats, and the average weight of kernel and of groat on resulting F_1 individuals also was increased considerably. F_1 oats plants usually exceeded their parental means, and in one cross their larger parent in plant height and panicle length. While oats hybrids usually contain fewer culms than their parents, crosses involving Victoria, a profusely tillering variety, usually exceeded it in number of culms. In weight of total plant, straw, and grain, F_1 oats plants usually exceeded the parental average, and in some crosses the larger parent. Increased earliness often occurs in F_1 oats plants and earliness often is associated with reduced plant size, yet a proportional increased yield of grain to straw, as well as an actual increased yield of grain, was obtained from some oats hybrids, indicating increased functional efficiency of hybrid plants. The weight of individual glume was increased proportionately more than the weight of groat in F_1 oats kernels. The total groat yield and proportion of groat to total weight of plant usually approached that of the more productive parent. Heterosis may be observed in a few plant parts in some crosses and in many parts in others. The assumption of linkage seemed unnecessary to explain these latter cases.

Observations on two forms of sterility in rice, G. M. REYES, V. BORJA, and J. P. TORRES (*Philippine Jour. Agr., 4 (1933), No. 2, pp. 99–118, pls. 7, figs. 2*).—White sterility, causing estimated losses from 14.4 to 24.4 percent in varieties severely affected in lowlands and up to 25 percent in highlands, especially in early-maturing sorts, is believed to be an inherent varietal character, although it may be induced by adverse weather conditions affecting the vigor and fertilization of the rice plant. There is evidence that white sterility results from the formation of defective or degenerate reproductive organs in the panicle containing normal flowers. Cross sterility, characterized by the formation of empty, straw-colored flower glumes distributed among the normally developed grains in the panicle, is believed to be a hereditary character resulting through natural or artificial crossing of varieties possessing wide morphological characters or distantly related in inheritance, and it may arise from crosses exhibiting sterility in one or both parents. Decreases in yield resulting from the occurrence of cross sterility were estimated in two hybrid types at from 8.8 to 31.5 percent and from 20.3 to 60.3 percent. A tendency was noted for sterility to increase in ratio in the succeeding generations.

Miscellaneous genetic data from wheat crosses, G. STEWART (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 249, 250*).—F_3 progenies of six wheat crosses studied at the Utah Experiment Station furnished segregation data on spike density, chaff color, and awning.

The bud sport situation in pomology, M. J. DORSEY (*Ill. State. Hort. Soc. Tans., 67 (1933), pp. 212–224*).—A brief discussion is offered of the genetics of bud mutations, their commercial significance, and their nomenclature with regard to the parent.

Inherited lethal characters in domestic animals, F. B. HUTT (*Cornell Vet., 24 (1934), No. 1, pp. 1–25, figs. 8*).—The author cites and describes the occurrence in domestic animals of the following numbers of hereditary lethal

abnormalities: Cattle 11, sheep 6, swine 4, horses 2, dogs 2, fowls 5, and ducks 1.

Hereditary variations in the blood cytology of normal rabbits, A. E. Casey, P. D. Rosahn, C. K. Hu, and L. Pearce (*Science, 79 (1934), No. 2043, pp. 189, 190*).—Wide variations in the blood cell formulas of normal rabbits have been found to be relatively stable, but the blood cells varied with the breed and were closely related to the natural resistance of the rabbits to certain diseases.

A statistical study of 14 blood factors showed that 11 had significantly greater variance between breeds than within breeds. The blood formulas of related breeds showed a closer relationship than the blood formulas for relatively unrelated breeds. It was observed that the heavier breeds had significantly higher total white blood cells and basophile and monocyte counts, and lower hemoglobin and red blood cell counts per cubic millimeter, than the smaller and lighter breeds. The breed differences in the blood formulas suggest the inheritance of these characteristics.

Recessive coloration in Dutch Belted cattle, R. B. Becker (*Jour. Heredity, 24 (1933), No. 7, pp. 283–286, figs. 2*).—Data are presented on the color of three calves born to a Dutch Belted cow mated to a solid dark fawn-colored bull at the Florida Experiment Station. Two of the calves were red in color with white belts, and the other was black with a white belt. All of them showed spots.

Evidently the black coat color of Dutch Belted cattle is dominant to Jersey red. The white belt is dominant to Jersey characters for solid color, or at least exhibits itself in the presence of recessive white spotting, which in the Jersey appears to be dominant to the recessive red of the Dutch Belted cattle.

The restricted extension color factor in Zebu cattle, A. O. Rhoad (*Jour. Heredity, 24 (1933), No. 9, pp. 347, 348, figs. 2*).—Examples of the restricted extension of coat color in Zebu cattle from Brazil are noted, in which the black was limited to the ears; muzzle; eyes, eyelids, and eyelashes; feet; shanks; and tail. Irregular but clearly-defined spots also appear on the animals.

Congenital melanotic skin tumors in swine, J. E. Nordby (*Jour. Heredity, 24 (1933), No. 9, pp. 361–364, figs. 2*).—An account is given of the occurrence of 10 pigs with a typical wart in matings of an affected pig to two of his daughters. These tumors were melanotic and cutaneous in character and were apparently of a benign nature. As the condition appears to be hereditary, it is suggested that all affected males and females, or those which have produced an affected pig, be eliminated.

The reaction of dominant white with yellow and black in the fowl, C. H. Danforth (*Jour. Heredity, 24 (1933), No. 8, pp. 301–307, figs. 3*).—A study of various matings of Buff Leghorns with Black Minorcas indicated the operation of a gene for dominant white which was not very effective in suppressing the yellow factor in the plumage of Buff Leghorn fowls. This cross produced two distinct types, one black with brown eye rings and a yellowish wash anteriorly, and the other white with black legs and a faint sooty cast anteriorly. Evidently in birds homozygous for yellow the white becomes hypostatic and fails to appear, although dominant white suppresses black completely.

It is suggested that age and sex differences in the amount of yellow exhibited by dominant white birds are due to endocrine differences.

Inheritance of albinism in the domestic fowl, D. C. Warren (*Jour. Heredity, 24 (1933), No. 10, pp. 379–383, figs. 2*).—The occurrence of pink-eyed chicks in a White Wyandotte flock is noted. One such male, raised to sexual maturity at the Kansas Experiment Station, was crossed with colored females.

The F_1 females, back-crossed to their sire, produced 42 chicks with white plumage, of which 38 had pink eyes; and 46 with colored plumage and normal eyes.

The results of these matings, together with matings of F_1s with two other pink-eyed white males, suggested that this condition was due to a factor for albinism and was thus a fourth factor for the production of white in fowls.

The possibility of the albino condition being due to a close linkage of a factor for recessive white and a factor for pink eye was suggested, but in 286 pink-eyed chicks produced all were white and no crossing over was observed.

Although the albinos had no pigment in the eye, they were able to deposit xanthophyll pigment in the egg yolk and in the legs.

Frequent reference is made to the poor visibility of the albino chicks.

Limited value of ancestors' egg production in poultry breeding, M. A. JULL (*Jour. Heredity, 25 (1934), No. 2, pp. 61–64*).—In a study of the egg records of 701 daughters produced by 15 different Rhode Island Red sires and 121 dams at the U.S. Animal Husbandry Experiment Farm, Beltsville, Md., no *significant relationship was found between the egg production of the dams* and the mean egg production of their daughters, or between the daughters' production and the production of their paternal granddams or either of their paternal great-granddams. However, a significant relationship was shown between the egg production of the birds and their three nearest female ancestors on the sires' and dams' sides of the pedigree. The difference observed was 2,096 × the standard error, which, with the numbers involved, indicated a value for p of 0.047.

Sex control again, L. J. COLE and I. JOHANSSON (*Jour. Heredity, 24 (1933), No. 7, pp. 265–274, figs. 4*).—A presentation of certain theories for voluntary sex control, with reasons and evidence against their operation.

The role of ovarian extract in bovine sterility, E. R. FRANK (*Cornell Vet., 24 (1934), No. 1, pp. 75–79*).—The use of an ovarian extract to bring about heat and ovulation in cows which were sterile without a uniform cause is noted.

FIELD CROPS

The influence of crop plants on those which follow, IV, T. E. ODLAND, J. B. SMITH, and S. C. DAMON (*Rhode Island Sta. Bul. 243 (1934), pp. 33*).—The fourth contribution of this series (E.S.R., 58, p. 222) reports field crop experiments on the effect of certain crops on succeeding crops for the period 1924–30, and also similar results with market-garden crops from 1926 to 1931 and in pot tests from 1926 to 1932. Results obtained in previous years are also summarized. A uniform crop of timothy was grown on the field plats in 1926–27, and in 1930 four uniform crops, corn, rutabagas, mangels, and potatoes, were grown over the entire area. Timothy produced its highest yields following onions, rye, and oats, and least after rutabagas and timothy. Rutabagas and mangels in 1930 varied the most in yield following different crops, the yields, when they succeeded themselves, being less than half of that on the highest yielding plat in the series. Corn and potatoes also showed considerable but not so extensive variations in yield following different crops. Lettuce grown as a late crop following early crops made better growth after potatoes and beets than after peas or cabbage. Spinach yielded highest after potatoes and lowest following peas.

In the pot experiments a uniform crop of buckwheat was grown in 1929, following preceding crops of onions, buckwheat, rye, redtop, and mangels, all grown on three different levels of nitrogen. Mangels were used as the uniform crop in 1932. Buckwheat yielded less after itself on all nitrogen levels than

after rye or redtop. Mangels yielded less following themselves on all three levels of nitrogen than following other crops, and their yields after buckwheat were also considerably below those after the other crops. The preceding crops of mangels left the soil more acid in these pots than did either rye or redtop. An association was evident between the influence of the preceding crop on soil acidity and the yield of a following crop of mangels. More than one factor appeared to be operative in causing the detrimental effects noted in the field plat yields following certain crops.

None of the 16 different crops under study could be classed as uniformly detrimental or uniformly beneficial to all following crops. These crops are grouped as to effects on following crops in general. Certain of the crops used leave the soil more acid than others, which is reflected in lower yields of at least some of the following crops. A definite relationship between acid-base removal by preceding crops and yield of the 4 crops grown uniformly on all plats in 1930 could not be established. The removal of mineral elements by the preceding crop and yields in 1930 were not found to be correlated significantly.

The effect of certain crops on succeeding crops, T. E. ODLAND and J. B. SMITH (*Jour. Amer. Soc. Agron., 25 (1933), No. 9, pp. 612–618*).—A shorter account of the experiments noted above.

Rotations and cropping systems, D. W. PITTMAN (*Utah Sta. Circ. 103 (1934), pp. 8, fig. 1*).—Their adaptations, merits, and disadvantages are described briefly for the specialist continuous-cropping, regular rotation, and what is termed "opportunist" cropping systems, and the short, long, interrupted, incomplete, and multiple crop rotations.

Experiments in the improvement of hill pasture, R. G. HEDDLE and W. G. OGG (*Scot. Jour. Agr., 16 (1933), No. 4, pp. 431–446*).—Several types of seminatural grassland on the Edinburgh and East of Scotland College of Agriculture Experimental Farm in Midlothian, typical hill grazings, and their associated soil conditions are described. Fertilizer experiments demonstrated that the most responsive herbages are those subject to flushing by hard spring waters. Certain types do not respond to fertilization, perhaps because of the lack of white clover and other superior herbage plants, the presence of a thick mat on the soil surface, and inadequate grazing. Artificial irrigation of unflushed ground with spring water has led to a marked improvement in grazing and to changes in the soil and the botanical character of the sod, white clover and broad-leaved grasses being favored as against bristle-leaved grasses and heath plants. Spring burning of *Nardus stricta* has greatly reduced the amount of blooming in the following season, and maintains the herbage in a more useful condition for stock.

Experiments in growing roots as feed crops, H. L. WESTOVER and H. A. SCHOTH (*U.S. Dept. Agr., Tech. Bul. 416 (1934), pp. 15*).—Varietal trials with mangels, rutabagas, turnips, and carrots were made in cooperation with the Kansas, Montana, North Dakota, and Oregon Experiment Stations, as well as in Ohio, South Dakota, and Wyoming, in different periods from 1920 to 1932, under both dry-land and relatively humid conditions. In most of the tests mangels yielded somewhat more than the other root crops tested, the Mammoth Long Red mangel usually being outstanding. Rutabagas produced about the same tonnage as mangels at Moccasin, Mont., while at Astoria, Oreg., both rutabagas and turnips had a considerable advantage over mangels. Carrots generally were the least productive of the roots tested. Varietal differences in yields of rutabagas, turnips, and carrots were not very consistent. While roots in general produced more succulence per acre than was obtained under

similar conditions from corn or some other silage crop, the large amount of hand labor required tends to restrict their production materially. Cultural and feeding recommendations have been noted in Farmers' Bulletin 1699 (E.S.R., 69, p. 354).

[Field crops research in Ohio] (*Ohio Sta. Bul. 532 (1934), pp. 17, 18, 22–32, 53, 93, 94, 95, 96, fig. 1*).—Continued agronomic research (E.S.R., 69, p. 38), for which results are reported, was concerned with the effect of soil reaction upon growth of alfalfa and clover and of benefits resulting from their successful production upon the yield of cereals in the rotation, by R. M. Salter; effects of fertilizers in changing the flora of permanent pastures, by D. R. Dodd; effect of soil type upon yield of wheat, by E. G. Bayfield; dry v. wet method of inoculating legume seed, by H. W. Batchelor; corn hybrid and variety experiments, by G. H. Stringfield; variability in corn characters as affected by soil fertility, by J. D. Sayre; the rate of seeding alfalfa, by C. J. Willard, J. S. Cutler, and J. B. McLaughlin; Scioto soybeans, by J. B. Park; the calcium-phosphorus ratio in hay crops, by J. W. Ames; lawn experiments, by F. A. Welton and L. A. Malik; proper placement of fertilizer for potatoes, and increasing the growth of rye with nitrogen fertilizer, both by J. Bushnell; and the feasibility of the alfalfa-timothy meadow in eastern Ohio, reduction of corn acreage by changes in the cropping system or other means, plowing under sweetclover for wheat, use of the orchard cultivator for preparing dry sod and oat stubble for wheat seed beds, and drilling in the row v. broadcasting fertilizer for tobacco, all by M. A. Bachtell.

[Field crops work in Puerto Rico in 1933] (*Puerto Rico Sta. Rpt. 1933, pp. 3–7, 8–12, 16, 17, figs. 9*).—Progress is again reported (E.S.R., 69, p. 38) briefly from breeding work, trials of seedlings, hybrids, introduced varieties, and adaptation tests of Mayaguez varieties and their distribution, all with sugarcane; selection work and variety tests with yams; fertilizer trials with dasheens, taros, and yautias; and comparison of old v. new seed corn. The agronomic behavior and other characters of Mayaguez 28, 63, 42, P.O.J. 2878, and other seedlings (E.S.R., 70, p. 178) are discussed in some detail.

[Field crops research in Rhode Island] (*Rhode Island Sta. Rpt. [1933], pp. 59, 60, 61, 63–65, 70, 71*).—Experiments reported on briefly comprised studies of the fertilizer needs of silage corn, lawn and turf grasses, and bentgrass for seed production; response of potatoes to magnesium, different phosphorus carriers, and to previous fertilizer treatment of the seedstock; effect of crops on succeeding crops; control of lawn weeds and pests; studies of relative resistance of lawn grasses and weeds to varying quantities of aluminum in solution cultures; breeding work with alfalfa; source of seed trials with potatoes; and variety tests with lespedeza, soybeans, and silage corn.

Determination of hardiness in alfalfa varieties by their enzymatic responses, H. M. Tysdal (*Jour. Agr. Res. [U.S.], 48 (1934), No. 3, pp. 219–240, figs. 3*).—The relation of varietal hardiness and the hardening-off condition in alfalfa to enzymatic activity, with particular reference to the diastatic enzymes, was studied during 3 yr. by the U.S. Department of Agriculture cooperating with the Nebraska Experiment Station. In alfalfa tops the diastatic activity was found to be correlated closely with rapidity of growth and not with hardiness of the varieties, even in the fall under hardening conditions, while the activity in the roots does not decrease with dormancy. The roots have about five times as much diastatic activity per gram of dry matter as tops from the same plants. Early studies indicated the importance of determining the original activity (diastatic activity of fresh root extract) and the

protected activity (diastatic activity after the extract is subjected to 70° C. for 10 min.). The methods used and the necessary equipment for the determinations are detailed.

When Turkistan, Grimm, Nebraska common, and Arizona common alfalfa varieties were studied at semimonthly intervals for a continuous period of 8 mo., from September to April inclusive, they did not differ widely and there was no great seasonal difference in the original activity. However, a higher concentration of sugar could be produced from a limited amount of starch by enzymes taken in the fall than from those taken in the spring, and during the fall a higher concentration could be produced from hardy than from less hardy varieties.

The protected activity gave greater and more consistent values for both seasonal trends and varietal differences. It increased rapidly in all varieties in the fall, reaching a maximum from October to late November and extending into January. Afterward there was a gradual decrease, reaching a minimum in April, more than 2 weeks after growth started and when the new growth was from 6 to 8 in. high. The protected activity increased more rapidly and maintained a higher value in some varieties, especially the hardier, than in others. In general the varietal differences were marked and consistent in the fall, but no consistent relationship was shown.

Supplemental experiments showed that sugar content, amino acids, and H-ion concentration also influenced the protected activity. Since these along with other factors apparently influence cold resistance, a measure of the stability of the enzyme when subjected to heat is suggested as a method for determining varietal resistance to cold as well as for further fundamental studies on the problem of cold resistance and related phenomena.

Growing alfalfa, H. L. Westover (*U.S. Dept. Agr., Farmers' Bul. 1722* (*1934*), *pp. II+30, figs. 7*).—This is a revision of and supersedes Farmers' Bulletin 1283 (E.S.R., 48, p. 732).

Management of bluegrass pastures in Missouri, E. M. Brown and J. E. Comfort (*Missouri Sta. Circ. 175* (*1934*), *pp. 4, fig. 1*).—Suggestions on when to begin grazing bluegrass pasture, regulation of grazing, supplementary pasture, fertilizers, reseeding, and weed control are based in part on results of studies in cooperation with the U.S. Department of Agriculture.

Investigations on the development of prussic acid in cholam (Sorghum vulgare), C. N. Acharya (*Indian Jour. Agr. Sci.*, *3* (*1933*), *No. 5, pp. 851–869, pls. 2, figs. 2*).—Changes occurring in the cyanogenetic capacity of the cholam plant as influenced by growth stage and environmental factors were studied at Coimbatore Agricultural College, where a satisfactory method was devised for the estimation of the cyanophoric content of poisonous cholam.

The prussic acid content of a normal crop decreased from the early stages (0.2 to 0.3 percent) progressively until the flowering stage, at which it could be considered harmless. The leaves contained about 60 percent of the total cyanogen compounds present in the plant, and a higher percentage on a dry matter basis than the stem or root. The total prussic acid content and the percentage on the dry matter were found to be lowest in the morning and to increase up to about 2 p.m., after which a slight decline was observed until 6 p.m., followed by a rapid decline in the night.

Seedlings younger than 40 days, plants stunted by drought, second growth or ratoons, and secondary shoots were found to have the highest content of prussic acid (0.1 to 0.2 percent) on a dry matter basis. Seedlings grown in darkness showed as high a percentage as those grown in sunlight. Drying in the shade decreased prussic acid content only about 10 percent, and drying in

the sun only 30 to 40 percent. Heating the tissues to 100° C. and keeping them at that temperature for several hours destroyed the poisonous principle. Immersing poisonous cholam for a short time in 10 percent sulfuric acid also effectively destroyed the cyanophoric group. Silages prepared from cholam thinnings (seedlings) and second growth (ratoons), originally rich in prussic acid (0.1 to 0.2 percent), gave only a trace of the poison after two months' silaging.

There was evidence that the cyanophoric group present in cholam might not be wholly in the glucosidal form but might also be present in less stable combinations, and an attempt was made to classify the different groups. A simple iodine test is given for differentiating between poisonous and nonpoisonous cholam, based on the accumulation of starch in the stem of poisonous plants.

The time of cutting the true clovers, C. J. WILLARD, J. S. CUTLER, and J. B. McLAUGHLIN (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 39–43, figs. 3*).—Considering the yields of hay and of protein per acre and the protein content of hay during the period 1930–33, in cooperative tests at Holgate, Ohio, with the U.S. Department of Agriculture, it seemed that for best results in northern Ohio medium red clover should be cut during the second week of June, with the first week preferable to the third insofar as quality of product is concerned. Alsike clover also should be cut during the second week of June, and mammoth red clover during the third and fourth weeks of June. Clipping mammoth red clover intended for seed to reduce the amount of straw to be handled appeared decidedly unsafe after May 20, and it probably reduces the seed crop whenever practiced. There was no indication that rolling the first cutting of mammoth when left for seed affects the actual seed yield. The conclusions were supported by experiments by Willard at Columbus, wherein there was some indication that the best cutting dates are somewhat earlier than at Holgate.

The value of clover as a purveyor of nitrogen to other crops, C. E. THORNE (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 35–38*).—Comparisons of yields in prolonged rotations including corn, oats, wheat, and clover, at the Ohio (40 yr.), Pennsylvania (40 yr.), and Missouri (30 yr.) Experiment Stations and the Ohio Northeastern Experiment Farm (39 yr.) showed that the sum of the gains of the corn, oats, and wheat in the rotation over their yields when grown continuously greatly exceeds the weight of the clover hay, indicating that if these gains are credited to clover, its hay value is less than half its total value. That clover deserves this credit was shown by the decreasing yield in long rotations as distance from the clover crop increased. In Ohio each crop on the continuously cropped plat received each year minerals plus 160 lb. of sodium nitrate, yet the effect of one year's growth of clover distributed over corn, oats, and wheat in the rotative cropping plat receiving smaller allotments of minerals and no nitrogen was much greater than that of the 480 lb. of sodium nitrate. On unfertilized land at the Ohio Station, lime alone raised the corn yield from 10.62 to 13.21 bu. per acre for the entire period, rotation alone increased it to 20.84 bu., and lime and rotation combined, to 30.19 bu. On fertilized land liming alone did not affect greatly yields of continuous corn, since sodium nitrate reduced to some extent demands for lime, but rotated corn increased markedly in yield, lime and clover together producing one third more grain than lime and sodium nitrate, notwithstanding the smaller allowance of mineral fertilizers.

Corn culture, H. B. BROWN (*Louisiana Sta. Circ. 8 (1934), pp. 2*).—Highest corn yields in tests made in 1933 were obtained in plantings from March 10 to May 20; from Cockes, Hastings, and Whatley, all prolifics, and Tuxpan,

Yellow Creole, and Clovelly Yellow; and from corn spaced 1 ft. apart in 4-ft. rows with soybeans sown at corn-planting time.

The effect of nitrogenous fertilization on the protein content of corn when harvested for silage, C. B. Bender and A. L. Prince (*New Jersey Stas. Bul. 563 (1934), pp. 4*).—Corn fertilized with the commercial fertilizer materials Nitrophoska and Leunasalpeter produced greater total yields of corn silage and acre yields of protein, but nitrogen fertilization up to 450 lb. per acre did not increase the protein percentage in the corn plant. Indications were that use of a heavy application of nitrogen on corn for silage does not justify the dairyman in reducing the protein in the grain ration.

The effect of time and rate of application of nitrate of soda on the yield of cotton, E. B. Reynolds, P. R. Johnson, and B. C. Langley (*Texas Sta. Bul. 490 (1934), pp. 20*).—The effect of the time and rate of application of sodium nitrate on the yield, length, and percentage of lint, size of boll, shedding, and other characters of cotton was studied with Mebane cotton on Kirvin fine sandy loam soil at Troup, and with Acala cotton on Ruston and Orangeburg fine sandy loams at Nacogdoches, from 1927 to 1930. The sodium nitrate was applied at rates of 100, 150, 200, 250, and 300 lb. per acre in combination with suitable amounts of superphosphate and potassium chloride, and applications of sodium nitrate before planting were compared with side dressings applied when the cotton was thinned to stand.

The 200-lb. application of sodium nitrate appeared adequate for cotton at Troup, and 100 lb. gave best results at Nacogdoches. These quantities of sodium nitrate with the superphosphate and potassium chloride are roughly equivalent to 400 lb. of 8–12–4 and 4–12–4 fertilizer, respectively. The side dressings of sodium nitrate at Nacogdoches resulted in an average yield of 203 lb. of lint per acre, or 13.4 percent more than where all nitrogen was applied before planting, but at Troup applications before planting produced slightly larger yields of cotton. These differences in yield seemed due to subsoil differences, the Ruston and Orangeburg soils having open friable clay subsoils and the Kirvin soil a less permeable subsoil. Sodium nitrate, mixtures of sodium nitrate and cottonseed meal, and ammonium sulfate, compared as nitrogen sources, produced practically the same cotton yields at Nacogdoches, although ammonium sulfate was the best nitrogen source at Troup.

All of the fertilizers used resulted in increased yield, size of boll, number of bolls per plant, percentage of 5-lock bolls, size of plant, number of fruiting branches, and earliness, but they did not increase the length or percentage of lint nor reduce the amount of shedding. Fertilizer practices are indicated for cotton on these soils.

Cotton spacing in southern Louisiana in relation to certain plant characters, J. R. Cotton and H. B. Brown (*Louisiana Sta. Bul. 246 (1934), pp. 35, figs. 4*).—In spacing experiments carried on from 1929 to 1933 under the warm and humid climate of southern Louisiana, with boll weevils usually plentiful in the cotton fields, a Delfos cotton strain was planted on alluvial land (partly Sharkey clay and partly a mixture of sandy alluvium), and D. & P.L. No. 4-8, Stoneville 2, and Dixie Triumph were planted on bench land (Denham silt loam) in 4-ft. rows at the spacings of unthinned, 2 stalks every 10 in., 2 at 20 in., 2 at 30 in., and 1 stalk every 30 in. The actual spacing obtained as shown by count of mature plants differed somewhat from the planned spacings.

The closely spaced plats had the lowest plants but carried the greatest total plant growth. Close spacing increased earliness as measured by rate of blooming early in the season and by the percentage of crop harvested the first

picking. The spacing of 2 stalks 10 in. apart gave the most blooms for the season. The rate of shedding of forms was greatest in the unthinned cotton and decreased as the spacing was widened. The size of boll increased regularly as the spacing widened. Boll rot was somewhat more prevalent in the closely spaced than in the wide spaced plats. The spacing distances used seemed to have no effect on lint percentage, although under some conditions close spacing appeared to shorten the staple length.

The spacing of 2 stalks 20 in. apart yielded highest on both types of soil, but differences between yields of the spaced plats were not significant. Unthinned cotton (about 59,000 plants per acre) gave the lowest yields on both lands. Spacings indicated were for hill land in north Louisiana 2 to 4 stalks 10 to 15 in. apart in 3-ft. rows, valley land in north Louisiana 2 stalks 15 in. apart in 4-ft. rows, and on better lands in central and southern Louisiana 1 stalk every 10 in. or 2 stalks every 20 in. in rows at least 4 ft. apart.

Cotton breeding investigations, 1928 to 1932, G. N. STROMAN (*New Mexico Sta. Bul. 217 (1934), pp. 39, figs. 14*).—The progress of breeding work with Acala cotton is detailed for 1928, 1929, 1930, 1931, and 1932. An early phase of the work has been noted (E.S.R., 63, p. 731). Quality of lint, particularly as to uniformity of length, was of prime importance in this breeding work. Originally uniformity was measured by the range in length of lint within the progeny, but in 1932 the sorter method was adopted. The convolutions or natural twist of fiber and size of fibers were studied in 1931. The seedling vigor test, begun in 1932 because of a need for better seedling stands of cotton, was used with some success. Family No. 504 of the 1931 progeny test was outstanding in length and uniformity, while in 1932 the progenies from No. 504 were outstanding in length of lint as to the range within progenies and with respect to the sorter method of testing for length of fibers.

Spinning quality of cotton in relation to seed purity and care of seedstocks, J. H. MOORE and R. T. STUTTS (*North Carolina Sta. Tech. Bul. 45 (1934), pp. 37, figs. 9*).—The changes in fiber properties of Mexican Big Boll (6–1–9) cotton when grown and handled under farm conditions and the relation of these changes to spinning quality were studied in cooperation with the North Carolina State College Textile School and the U.S. Department of Agriculture. Seed of this strain grown at the station in 1929 and eight lots of seed of the same strain grown on private farms for 1 to 3 yr. without selection were grown under uniform conditions on the same field in 1931, and the second picking was used for the spinning tests.

Lack of significant differences in fiber strength, diameter, and weight indicated that these properties did not influence the yarn strength of the cottons. Combed samples of seed cotton from pure and mixed seed differed considerably in variability of staple length, and these differences showed a correlation with yarn strength. In Baer-sorter arrays prepared from composite samples of the ginned cotton, the curves of measurements indicated a change in fiber distribution due to a shifting and decreasing fiber length. Comparisons of fiber length by several methods showed that some of the lots differed significantly in this property. A strong negative association was disclosed for the relation of yarn strength and the percentage of fibers ⅞ in. and shorter. Cotton from registered seed made the strongest yarns in all counts.

Although the yarns spun from cottons grown from practically pure seed for periods of 2, 3, and 4 yr. away from the station showed no significant differences in strength, as a whole they were from 4 to 6.5 percent weaker than those spun from cotton grown from registered seed. The yarns spun from cottons grown from mixed seed had the lowest breaking strengths, being from 12 to 13.5

percent weaker than the same counts spun from registered seed. No special difficulty was encountered in manufacturing the several lots of cottons.

The value of pure seedstocks in the manufacture of strong yarns and of the precautions taken by growers to keep their planting seed pure was demonstrated by the experimental results. Maintaining purity of seedstocks prevented a marked decrease in length of staple. Where mixing of seed took place, due to lack of such precautions, the proportion of shorter fiber lengths was increased.

Uniformity of cotton fiber determined by field inspection, O. F. Cook and A. Y. Willis, Jr. (*U.S. Dept. Agr. Circ. 310* (*1934*), *pp. 24, pls. 8*).—This discussion of the function of field inspection in determining uniformity of cotton fiber points out the need for uniform cotton and the relation of buyers to producers, states that both pure seed and equable conditions of growth are essential, discusses the relation of staple and substaple (shorter fibers always to be found among the long fibers on the seeds) to uniformity, describes substaple as a waste factor and its relation to classing, indicates the range of fiber lengths in classing, tells of ways to avoid excess substaple and damaged fiber, explains the preclassing of community cotton, and specifies community advantages in marketing.

Growing flax in New Jersey, H. B. Sprague (*New Jersey Stas. Circ. 305* (*1934*), *pp. 4*).—Practical information is given on the place of seed flax in the cropping system, soils, fertilizers, cultural and harvest practices, and varieties suitable for New Jersey. The Linota and Redwing varieties were outstanding during the period 1928–33.

Orchard grass in Missouri, C. A. Helm (*Missouri Sta. Circ. 172* (*1934*), *pp. 7, figs. 2*).—Orchard grass is described as the best grass for hay and pasture on poor to medium land, especially valuable for pasture, meadow, and seed on Ozark soils, and also well adapted to the prairie soils of southwest Missouri, the lowlands of southeast Missouri, and the level prairie and rolling timberlands of north Missouri. It is compared with timothy for various purposes, and remarks are made on its place in cropping systems, seeding methods and harvesting for seed and hay, pasturing the grass, and its merits for permanent Ozark pastures.

Results of irish potato experiments in the Bluewater, New Mexico, Irrigation District, F. Garcia and S. C. Young (*New Mexico Sta. Bul. 218* (*1934*), *pp. 28, figs. 7*).—Variety and irrigation tests were carried on in cropped and virgin soil in the Bluewater-Toltec Valleys in western Valencia County during the period 1927-33. Best yields were to be had from a good fertile loamy soil, preferably one growing alfalfa and containing much organic matter. Fall plowing was preferred to spring plowing, since the latter leaves the seed bed too rough for best results. In none of the years was the precipitation sufficient for a good crop. The best results were obtained from three or four irrigations, depending on the seasonal rainfall. With a dry soil in the spring, irrigation before planting or just after seemed necessary for good stands.

Idaho Rural, Green Mountain, Irish Cobbler, Bliss Triumph, and Peachblow were outstanding varieties. A variety adapted to the district and good disease-free certified seed seemed essential to success. Early blight in 1930-33 was an important factor reducing yields of No. 1 tubers, especially with some of the late-maturing potatoes. Early varieties could be harvested by September 15 and late-maturing sorts by October 1 to 7. Yields were comparatively light, although the quality of the crop was good.

Press Bulletin 664, Early Blight of Irish Potatoes, by R. F. Crawford, is appended.

Soybeans in Iowa farming, A. MIGHELL, H. D. HUGHES, and F. S. WILKINS (*Iowa Sta. Bul. 309 (1934), pp. 145–206, figs. 22*).—The status of soybean hay and seed production in Iowa is reviewed, and the uses of the crop, its position in the cropping system, suitable varieties, cultural methods and field practices, and the labor program for soybeans are described from earlier (E.S.R., 53, p. 636) and continued experiments and the practices of Iowa farmers.

The soybean acreage in Iowa, excluding that interplanted with corn, grew from 471 in 1919 to 192,000 in 1933, 35 percent of the crop, a lessening portion being harvested for seed. Estimates were that in 1931, 68 percent of the crop acreage supplied feed for cattle, 8 for hogs, and 18 percent was sold. The crop seems particularly adapted to southeastern Iowa and to the dairy section, but the relative importance in northern and western Iowa has increased because of the depression. Soybeans compete with other crops most successfully on acid soil low in nitrogen and organic matter, although they hasten erosion on rolling land and cannot compete with alfalfa, red clover, and sweetclover on sweet soils. The crop often levels out labor requirements on southern and eastern Iowa farms, but it conflicts with corn cultivation on western and northwestern Iowa farms.

Recommended practices include a seed bed prepared as for corn; the Manchu, Illini, Dunfield, Mukden, and Black Eyebrow varieties for seed and hay; planting between May 15 and June 5 in southern Iowa, and May 25 and June 5 in northern Iowa; 2 bu. per acre when drilled solidly or at least 1 bu. in 42-in. rows, and 1.5 to 2 in. deep; and cultivation for weed control with the harrow or rotary hoe and with the corn cultivator as needed with beans in rows.

Harvesting for seed with a combine saves time, compared with threshing, without much difference in cash costs and may be much cheaper than other methods if acreage and other conditions are favorable, although the method including binding, shocking, and threshing is used most and is usually satisfactory. Mowing and raking up saves time, but needs more labor, and losses from shattering are greater. In harvesting soybeans for seed the use of a combine necessitates only one-third as much time as threshing and makes little or no change in cash costs. In harvesting soybeans as hay, Iowa farmers employ hand cocking, cocking with a rake, picking up with a hay-loader after curing in the swath, or cutting with the grain binder and curing in bundle shocks. On the farms studied an average of 10.5 hr. of labor was needed to produce 1 acre of seed and 14 hr. to produce 1 acre of hay, i.e., about three quarters of the time required for corn under average Iowa conditions.

The soybean crop in Missouri, B. M. KING (*Missouri Sta. Circ. 174 (1934), pp. 15, fig. 1*).—Practical information is given on the essentials of soybean production, including the best varieties for hay or seed and for planting in corn in Missouri; cultural methods and field practices; growing the crop in mixtures with Sudan grass, small grain, and corn; harvesting for hay and for seed; the place of soybeans in the crop rotation; their effect upon following wheat yields; their value for soil improvement and as feed; and the cost of producing them.

Experiments on the value of decorticated sugar-beet seed, F. HANLEY (*Jour. Min. Agr. [Gt. Brit.], 41 (1934), No. 1, pp. 21–28*).—In field trials in eastern counties of England, 1931–33, supplementing studies at Cambridge University (E.S.R., 66, p. 631; 68, p. 41), sugar beet seed decorticated with sulfuric acid in general produced seedlings earlier and made better and more uniform stands and higher yields of washed beet than untreated seed. Milled seed gave intermediate results and was not so satisfactory as acid-treated seed.

Self-fertilization in sugar beets as influenced by type of isolator and other factors, H. E. BREWBAKER (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 4, pp. 323–337, figs. 6*).—Comparative studies by the U.S. Department of Agriculture and the Colorado Experiment Station cooperating, involving 10 types of bags, showed that certain bags were far more effective than others as isolation agents, as measured in terms of seed setting. A hand-made vegetable parchment bag, about 5.5 by 17 in. in size, gave the best results, and the hemp and kraft bags were next in effectiveness, while small parchment bags and cellophane bags were of little value. About 50 percent of the plants covered with muslin cages produced 100 or more seed per plant. Wide differences in relative humidity and temperature were obtained in different bags and cages, both under unshaded and shaded conditions. In the parchment and cellophane bags, higher relative humidity but lower temperature were noted than in the hemp or kraft bags, but these differences did not appear to correlate with the seed setting obtained. The results for seed setting suggest a practicable use for either bags or cages in intensive breeding or genetic work with sugar beets.

Tobacco Substation at Windsor, report for 1933, P. J. ANDERSON, T. R. SWANBACK, and O. E. STREET (*Connecticut* [*New Haven*] *Sta. Bul. 359* (*1934*), *pp. 331–382, figs. 6*).—Besides articles noted elsewhere in this issue, the following reports are made on experiments with cigar leaf tobacco (E.S.R., 69, p. 518).

The use of sulfate of ammonia in tobacco fertilizer mixtures, T. R. Swanback and P. J. Anderson (pp. 355–360).—Experiments during 12 yr., in which ammonium sulfate was compared in complete fertilizers with other nitrogen carriers and was used with and without lime, demonstrated that use of ammonium sulfate makes the soil more acid, and if enough is used through a sufficiently long period acidity increases until tobacco will no longer grow. Other soil changes observed included depletion of mineral bases, increase in ammonia nitrogen with decrease in percentage of nitrate nitrogen, decrease in available phosphorus, and increase in soluble aluminum and manganese. Ammonium sulfate makes cured leaves darker, thicker, and more prominently veined. As to the combustion characteristics, the fire-holding capacity is reduced, the ash is darker, the coal band is wider, and the taste and aroma are inferior.

Nitrophoska fertilizer tests, T. R. Swanback (pp. 361, 362).—In trials from 1930 to 1933, wherein Nitrophoska replaced all or half of the nutrients in the fertilizer, practically no difference in growth could be observed between tobacco on control plats and on those fertilized with Nitrophoska. Observations at time of sorting showed that check plats usually produced tobacco satisfactory in quality, while the half and all Nitrophoska plats produced dark and veiny tobacco, also a decrease in yield and grading.

Comparative studies of fuels for curing, O. E. Street (pp. 362–367).—Tests during 2 yr. to determine the merits of processed charcoals v. lump charcoal indicated that Ford Briquets do not differ greatly in efficiency from unprocessed material, while Eastman Charkets have some advantage. Measured in fuel consumed per degree gain over 264 hr., lump charcoal was 0.4 percent more efficient than Ford Briquets, and Eastman Charkets 12.1 percent more efficient than charcoal. None of the fuels appeared to have a consistent effect on the grading of tobacco if due weight was given to other factors. In 1933 the lump charcoal could be obtained for about $14 a ton in loose carload lots as compared with $28 for the processed fuels. While reduced handling and haulage charges, lower loss by breakage and pulverization, and greater cleanliness favor the processed fuels, their use may be confined to curing of shade tobacco, where the higher initial cost is not a prohibitive factor.

Shade curing experiments in 1933, O. E. Street (pp. 367–372).—Continued curing experiments in sheds showed that with reference to vertical position in the curing shed the better tobacco usually was found below the plate line of the shed. This was particularly true with tobacco picked after a heavy rain, and was correlated with a more adequate moisture supply, which retarded the curing of the thin leaves and thus produced lighter leaves. The second tier from the bottom always had the highest grade index. With dry-weather tobacco the same general trend was present but was less marked. Tobacco in the peak tier often was too yellow and mottled. The horizontal position was significant in the bottom tier and produced some difference up to the sixth tier. Tobacco nearest the outside walls had a greater percentage of light brown grades, while that in the interior of the shed showed more olive leaves, an effect due to temperature differences during firing.

Tobacco picked during a dry period was predominantly light brown in color with some mottling and staining, while that picked after a heavy rain was characterized by olive shades with a more uniform distribution of color on the leaves. Tobacco from light sandy knolls had a starved appearance and was rather badly stained and mottled, and that from heavy, water-logged soils was very dark and inferior. Additional humidification by mechanical means failed to show any advantage.

Commercial agricultural seeds, 1933, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 150 (1933), pp. 98–117*).—The purity, germination, weed seed content, and in the case of legumes the hard seed percentage are tabulated for 123 samples of agricultural seed collected from dealers in Maine in 1933.

Seed inspection, F. A. McLaughlin and M. E. Nagle (*Massachusetts Sta. Control Ser. Bul. 72 (1934), pp. 47*).—The germination, purity, and weed seed contents are tabulated for 185 official samples of field crop seed and 320 of vegetable seed collected in Massachusetts during the year ended October 1, 1933. Samples of sweet corn, alfalfa, red clover, and sweetclover were tested for trueness to type. The kinds of disease organisms that occur in commercial lots of sweet corn and their effects upon laboratory and field germination were also studied.

HORTICULTURE

[Horticultural experiments of the Ohio Station] (*Ohio Sta. Bul. 532 (1934), pp. 47–52, 54–56*).—Included in this report are brief résumés of work with a method of hastening break-down in apples to study the effect of fertilizer upon this condition, by J. H. Gourley; yield capacity of Golden Delicious and Cortland apples, by C. W. Ellenwood; spraying v. dusting for the control of apple scab, by F. H. Ballou and I. P. Lewis; hardiness of the flower buds of the peach, by J. S. Shoemaker; calcium cyanamide as a fertilizer for peaches and apples, by F. S. Howlett and Smock; effect of carbohydrate deficiency upon the formation of sex cells in the tomato, and the cause of flower abscission in overvegetative tomatoes, both by Howlett; the relation of soil moisture to growth and yield of greenhouse tomatoes, by I. C. Hoffman; the breeding of greenhouse and field vegetables, by Hoffman and L. Havis; testing of vegetable varieties at Marietta, by H. D. Brown; effect of irrigation on vegetables, fertilizers for muck vegetables, and sources of onion seed, all by D. Comin; photoperiod influences on garden stocks, by [G. H.] Poesch and A. Laurie; and water and fertilizer requirements of certain flowers, by Laurie.

[Horticultural studies in Puerto Rico] (*Puerto Rico Sta. Rpt. 1933, pp. 13–16, 17–19, figs. 5*).—Data are presented on the effects of shade upon the growth and development of the coffee plant; the effect of high potash fertilizers

on coffee yields; hybridization studies with sweet and field corns; and new hibiscus varieties originated at the station.

[Horticulture at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1933], pp. 61–63, 65–70, 79–85*).—Among studies discussed in this report are the fertilizer requirements of market-garden crops; stable manure v. green manure for vegetables; the testing of strains and varieties of lettuce, peppers, tomatoes, spinach, sweet corn, cabbage, beets, and other vegetables; the breeding of blackberries; fertilization of red raspberries; control of pests in the plum orchard; the comparative value of nitrate of soda and ammonium sulfate for celery; the optimum levels of soil nitrates for celery; the value of determining certain components of the juice of celery as an index to nitrogen requirements; the culture of greenhouse tomatoes; culture of gladiolus in the greenhouse; fertilizers for asparagus, by T. E. Odland and F. K. Crandall; and propagation and culture of vinifera grapes, by A. E. Stene.

Synopsis of Federal plant quarantines affecting interstate shipments in effect January 1, 1934, assembled by S. B. Fracker, R. A. Sheals, and M. A. Thompson. (*U.S. Dept. Agr., Misc. Pub. 189 (1934), pp. 135*).—This pamphlet contains brief information as to certificates and includes a list of restricted articles and of States and post offices, indicating the regulations applying to each.

Insecticides and fungicides, 1933, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 150 (1933), pp. 118–124*).—The results are presented of analyses of 82 samples of insecticides and fungicides collected and examined in 1933.

Irrigation for vegetable crops in Iowa, A. T. Erwin and E. S. Haber (*Iowa Sta. Bul. 308 (1934), pp. 113–143, figs. 7*).—At Ames overhead irrigation was found highly beneficial in the case of most vegetable crops, Bountiful bush beans and lima beans being the exceptions. Over a period of 6 yr. beets were greatly improved, both with respect to yield and quality, by overhead irrigation. Irrigated carrots were of higher quality and generally outyielded the nonirrigated over a 5-year period. Irrigated seed onions of the Southport Yellow Globe and Riverside Sweet Spanish varieties outyielded the nonirrigated by 69.6 and 89.1 percent, respectively. Transplanted onions benefited very decidedly from irrigation in certain seasons and were milder in flavor and of better color. Parsnip yields were increased by irrigation in 3 of 6 yr. Radishes were improved in quality and yield in each of 6 yr., and tomatoes yielded more heavily with irrigation in 4 of 5 yr.

On the Muscatine Island furrow-irrigated muskmelons outyielded the control plats in each of 4 yr., the increases ranging from 9.9 to 106 percent. Over a period of 6 yr. sweetpotatoes under irrigation outyielded the controls in four seasons, and in one year (1931) irrigation meant the difference between a crop and a complete failure. The percentage of marketable roots was increased by irrigation.

A 6-in. layer of straw greatly increased the yield of tomatoes in 4 out of 5 yr. under overhead irrigation at Ames, but paper mulch did not prove practical either under overhead irrigation at Ames or with furrow irrigation on the Muscatine Island.

Asparagus yields as affected by severity of cutting, E. P. Lewis (*Illinois Sta. Bul. 401 (1934), pp. 25–36, figs. 3*).—Experiments conducted with Mary Washington asparagus set at the Cook County Substation in 1926 showed that severe early cutting is injurious to both yield and quality of the spears. Under the conditions of the experiment even 2 weeks' cutting the first year after setting the plants decreased subsequent total yields as compared with

plants not cut until the second and third years. Cutting for 4 weeks the second year after setting also reduced subsequent total yields, but when cut for only 2 weeks did not prove harmful, and, in fact, increased yield over the total period above the plat not cut until the third season. At the same time quality, as measured by average weight of spears, was not diminished. Estimating the total yield of the plats not cut until the third year as 100 percent, the yield of the plat cut for 2 weeks the second year was 113 percent. Severe cutting during the first 3 yr. after setting retarded growth at the end of the third year, and from records taken later was apparently permanently harmful.

Celery production in Colorado, A. M. Binkley (*Colorado Sta. Bul. 407 (1934), pp. 32, figs. 10*).—A general discussion is offered on the various phases of celery production, including costs, propagation, field setting, irrigation, blanching, harvesting, marketing, control of pests, etc. The sections on celery diseases and celery insects were prepared in collaboration with E. W. Bodine and S. C. McCampbell, respectively, and the one on winter storage of celery was written by E. P. Sandsten.

Of three early celeries, Golden Plume, Tall Golden Self-Blanching, and Dwarf Self-Blanching, the Tall Golden Self-Blanching variety proved superior for local markets. Plants grown from seed of Giant Pascal secured from eight different sources varied considerably in weight, height of plant, and percentage of pithy plants and of marketable stalks.

Tomato culture in Missouri, E. J. Allen and T. J. Talbert (*Missouri Sta. Circ. 173 (1934), pp. 16, figs. 6*).—General information is given on soil and fertility requirements, plant production, transplanting, culture, training, varieties, protection from diseases and insects, etc.

The effect of soil temperature on the growth and ripening of tomatoes [trans. title], O. Riethmann (*Ber. Schweiz. Bot. Gesell., 42 (1933), No. 1, pp. 152–168, pls. 2, figs. 6*).—Observations on Schöne von Lothringen tomato plants growing in water-impermeable but heat-permeable pots placed in water baths provided with electric heating units and temperature regulators indicated that a minimum temperature of 20° C. is necessary for healthy vigorous development. Increments in growth were obtained up to about 33°. Maximum production was reached with 36° to 39° soil temperature, despite the fact that this range was already exerting an inhibiting influence on root development. Soil temperatures below 20° were not favorable to either yield or growth. Fruit size also increased with increasing soil temperatures up to a certain point in the vicinity of 30°. Maturity was hastened only with the aid of very high soil temperatures.

Factors affecting assimilation of ammonium and nitrate nitrogen, particularly in tomato and apple, V. A. Tiedjens (*Plant Physiol., 9 (1934), No. 1, pp. 31–57, figs. 6*).—Presenting a more complete account (E.S.R., 70, p. 475) of studies at the New Jersey Experiment Stations, the author again points out the necessity of determining the limitations in the use of different nitrogenous salts before a fair comparison can be made of their relative merits as plant nutrients and reports that in general ammonium and nitrate salts produce equally good growth under conditions favorable to each. The volume of growth obtained from ammonium and nitrate salts depended on the concentration of the salt in the nutrient solution and on available carbohydrates.

Soluble solids in the watermelon, L. R. Tucker (*Plant Physiol., 9 (1934), No. 1, pp. 181, 182, fig. 1*).—A study at the Idaho Experiment Station of the location and amount of soluble solids (chiefly sugars) in a watermelon of the Angeleno variety showed the highest concentration (11 to 15 percent) in the

tissues surrounding the seeds. The expressed juice from the green area just under the rind was low in soluble solids, 4.1 to 6.8 percent.

The propagation of fruit trees, J. Lambourne (*Malayan Agr. Jour., 22 (1934), No. 2, pp. 58–62, pl. 1*).—Successful application was made at the Central Experiment Station, Serdang, of the etiolation method of propagation, in which young shoots arising from pegged down and shallowly covered stems are severed and planted separately. In certain species, such as lime and citron, rooting occurred freely from the etiolated base, but in others, such as *Achras sapota*, *Nephelium mutabile*, and *Citrus aurantium*, it was found necessary to twist a wire tightly about the base of each shoot some time before severing to induce callus formation and rooting. Better results were obtained where the plants were not pegged down until the young shoots were several inches in length.

Dwarf seedlings from non-after-ripened embryos of peach, apple, and hawthorn, F. Flemion (*Contrib. Boyce Thompson Inst., 6 (1934), No. 2, pp. 205–209, figs. 2*).—The removal of the hard outer coat and the inner seed coat from freshly harvested peach, hawthorn, and apple seeds, species normally requiring a period of afterripening, resulted in the development of seedlings which exhibited a very slow rate of growth, almost dwarflike in character. However, after a few months the dwarfs took on a normal growth status.

Hydrion concentration changes in relation to growth and ripening in fruits, J. S. Caldwell (*U.S. Dept. Agr., Tech. Bul. 403 (1934), pp. 54, figs. 9*).—Determinations by means of hydrogen and quinhydrone electrodes and other procedures of the acidity changes in the expressed juice of various fruits, including apple, cherry, strawberry, tomato, orange, grapefruit, blackberry, raspberry, pokeberry, and elderberry, indicated that in general the young fruits at setting and for a short time thereafter have an H-ion concentration rather close to the general level found in the juice of vegetative tissues. This period of low acidity coincided with high solids content and with rapid and general cell division. There followed a short transition period during which the active acidity content of the young fruit rose rapidly to the high values of the developing fruits. Coincident with the rise in active acidity, water absorption also increased rapidly, the percentage of solids was reduced, and the fruit attained maximum hydration. Curves representing increase in active acidity, in water content, and in rate of percentage gain in weight began to rise practically simultaneously and pushed upward together. After reaching a maximum, active acidity and water content remained nearly stationary for a time, varying with the species. The maxima for active acidity and water content coincided in time with a marked flattening of the curve of percentage increment in weight.

A consistent relationship in several species between rate of growth and changes in active acidity and in water content leads to the supposition that a very large alternation in H-ion concentration markedly increases the imbibitional capacity of the protoplasmic colloids and of such cell wall constituents as pectins, which have isoelectric points well below the levels of active acidity encountered. The author advances a working hypothesis that variations in water absorption by the hydrophilic colloids resulting from changes in H-ion concentration of tissue fluids may be the factor of prime importance in determining the form and slope of the growth curve of a fruit.

Effects of temperature on apple trees, M. A. Blake and G. T. Nightingale (*N.J. Agr., 16 (1934), No. 2, pp. 2, 3*).—Observations on young Baldwin and Stayman Winesap trees grown at constant temperatures of 45°, 70°, and 95° F., respectively, with and without external supplies of nitrogenous fertilizers,

indicated that 70° is a favorable temperature for both varieties. At 45° the growth of all trees was greatly reduced. Absorption of nitrates continued at 45°, but the movement of newly synthesized organic nitrogen from the roots to the top was sharply inhibited in the Stayman variety, whereas in Baldwin translocation proceeded. An apparent explanation is thereby offered for the greater adaptability of Baldwin than of Stayman to cool climates.

At 95°, despite no wilting, Baldwin leaves assumed a pale green hue and made but little growth, and no new roots were produced. Stayman, on the other hand, manifested a much greater resistance to heat, not only holding its color but showing no root injury.

Pollination of the apple in Ohio, F. S. Howlett (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 65–70*).—Based on 10 years' studies at the station, supplemented with data secured elsewhere, general information is presented relative to self-fruitfulness, the value of different varieties as pollinizers, effective varietal combinations, planting arrangements, the role of insects in pollination, and the hazards of spraying or dusting during the blooming period.

The New Jersey standard for judging the growth status of the Delicious apple, M. A. Blake and O. W. Davidson (*New Jersey Stas. Bul. 559 (1934), pp. 23, figs. 8*).—Defining growth status as the internal metabolic status of the plant together with its external appearance and whether or not it is dormant or in some phase of root or top development, the authors point out that growth status in an apple tends to vary not only with normal developmental processes but between individual parts of a single tree. A standard based on the number, size, and shape of fruit spur leaves in trees of bearing age is given for the Delicious apple. The use of this standard permits an estimation of the potential capacity of trees to produee fruits of a commercially desirable size, color, and quality. The significance of the proposed standard is discussed, together with the interrelationships of soil, weather, and other environmental conditions.

Nitrogen and the apple tree, F. S. Lagassé (*Peninsula Hort. Soc. [Del.] Trans., 47 (1933), pp. 10–16*).—In connection with a general discussion of the nitrogen problem in the apple tree, the author presents certain data obtained by the Delaware Experiment Station on the economic results of applying nitrogen fertilizers to 18-year-old Jonathan trees which had been under various fertilizer treatments since planting and hence differed widely in development. Very large gains in yield and net returns were obtained by applying nitrate of soda to apple trees previously without any fertilizer or with only phosphorus and potash. The application of phosphorus and potash to trees previously fertilized with nitrogen, phosphorus, and potash proved of little value, but where nitrate was added the gains were material. Large applications of nitrogen to trees already in a vigorous condition failed to produce overvegetativeness or to decrease productivity.

Some orchard investigations, J. H. Waring (*Maine State Pomol. Soc. Ann. Rpt., 1931, pp. 28–34*).—In a preliminary trial at the University of Maine, calcium monosulfide was found effective in the control of scab on the leaves and fruit of McIntosh apples and was much less injurious to the foliage than was lime-sulfur. The average increases in trunk circumference of McIntosh trees in the calcium monosulfide, lime-sulfur, and control plats were 3.48, 2.75, and 1.98 in., respectively. The mulching of McIntosh, Northern Spy, and Wealthy trees with paper resulted in increased growth in the latter two varieties and a slight loss in McIntosh as compared with unmulched trees. The odds in the case of Northern Spy and Wealthy were 24 : 1 and 34 : 1, respectively, in favor of paper and in McIntosh 2 : 1 in favor of no mulch.

Missouri apple spraying: Recommendations for 1934, T. J. TALBERT, L. HASEMAN, and H. G. SWARTWOUT (*Missouri Sta. Circ. 177 (1934), pp. 8*).—A spray calendar particularly designed for commercial orchardists is presented, with suggestions relative to avoiding spray injury and the need of careful timing of sprays and of modifying schedules to meet certain requirements.

The effect of the stock on the time of flowering of the peach [trans. title], V. A. EVREINOFF (*Bul. Mens. Soc. Natl. Hort. France, 6. ser., 1 (1934), Feb., pp. 46, 47*).—In southern France, Belle de Vitry peaches budded on seedling peach stocks bloomed 22, 15, 8, 3, and 6 days earlier in 1929, 1930, 1931, 1932, and 1933, respectively, than did comparable trees on Saint Julien plum. The differences in the case of the Baron Dufour peach were 24, 16, 10, 5, and 6 days, respectively.

Relative hardiness of 157 varieties of peaches and nectarines in 1933 and of 14 varieties in 1934 at New Brunswick, N.J., M. A. BLAKE (*New Jersey Stas. Circ. 303 (1934), pp. 7*).—Records taken in the station orchards permit the classification of peaches and nectarines with reference to winter hardiness. Among the hardy peaches in 1933 (81 percent or more of living buds), were Greensboro, Pallas, Buttercup, Admiral Dewey, and Oriole, and among the least hardy (0 to 10 percent of living buds) were Elberta, J. H. Hale, Hiley, Brackett, and Primrose. Nearly all the nectarines examined showed marked resistance to low temperature. Observations in 1934 on 14 varieties again revealed Elberta, J. H. Hale, and Hiley as lacking in winter hardiness.

Notes on the trunk and shoot pubescence of European varieties of plums, J. S. SHOEMAKER (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 70–73, figs. 2*).—As a result of studies upon bearing trees during the dormant season, European plums are divided into two groups—(1) with bark of the trunk with fairly deep, vertical fissures, and (2) with relatively smooth bark. Again the varieties are divided into two groups—(1) those with shoots markedly pubescent, and (2) those with shoots lightly pubescent or nearly glabrous. Shoot pubescence, together with color and certain other characters, proved useful in detecting varietal mixtures during the dormant season.

Preservation of the Young and Lucretia varieties of dewberries by freezing, J. M. LUTZ, R. C. WRIGHT, and J. S. CALDWELL (*Fruit Prod. Jour. and Amer. Vinegar Indus., 13 (1934), No. 9, pp. 267–269, 281, fig. 1*).—Experiments conducted by the U.S. Department of Agriculture indicated that Youngberries may be frozen successfully in either airtight or nonairtight containers if packed in sirup at 45° or 50° concentration. The dry sugar product was slightly inferior to the sirup. A range of 0° to 10° F. was desirable for freezing, but later storage at 10° to 15° was adequate. Some evidence was obtained that frozen Youngberries make an excellent product for flavoring ice cream, sherbet, and ices. Lucretia dewberries packed in 50° sirup kept very satisfactorily for several months at 17° in both airtight and other containers.

A preliminary study of the fruiting habit of the black raspberry, Rubus occidentalis, G. A. BEACH (*Colorado Sta. Tech. Bul. 8 (1934), pp. 18, figs. 10*).—A statistical analysis of records taken on the production of each 6-in. section of canes and laterals of Plum Farmer black raspberry plants, (1) in which the young canes were shortened to 24 in. when they reached 30 in. in height, (2) same treatment plus a reduction in canes to the 7 best per hill, and (3) no treatment, showed little or no significant difference between treatments as to weight or number of fruits but a decided difference in the location of the fruits. Pinching tended to concentrate the bulk of the berries on branches distributed in the area between the first and third foot, whereas in the control plants the bulk of the crop was carried on main canes and was much more

widely scattered. The largest as well as the greatest number of fruits was produced on the lower portions of the plants.

Cytological studies of buds collected periodically during summer and winter of the vegetative and fruiting seasons showed no distinguishable morphological differentiation until spring of the fruiting year. It is believed, however, that differentiation may commence before there is any change of form in the primordia.

Strawberry growing in Missouri, T. J. Talbert (*Missouri Sta. Circ. 176 (1934), pp. 20, figs. 4*).—This circular discusses soils, fertility, varieties, planting, culture, intercropping, mulching, harvesting, protection from pests, etc.

Cranberry fertilizer, C. S. Beckwith (*New Jersey Stas. Circ. 313 (1934), pp. 2*).—Discussing the need and effects of fertilizers on cranberry bogs, the author suggests the use of 335 lb. per acre of a mixture of 450 lb. of nitrate of soda, 450 lb. of dried blood, 800 lb. of rock phosphate, and 300 lb. of sulfate of potash. It is advised that the use of fertilizers should be restricted to those soils too thin to support sufficient vines for profitable production.

Fruit-bud development in some citrus trees, C. E. Abbott (*Citrus Indus., 15 (1934), No. 2, pp. 5, 20, 25, figs. 3*).—Studies at the University of Florida showed that the differentiation of blossom buds of the Duncan grapefruit, Pineapple orange, and Owari satsuma does not take place until the beginning of growth in the spring or upon the resumption of growth at any other season of the year following a period permitting the accumulation of reserve nutrients in the tree. In the Nagami kumquat the majority of fruit buds formed for the crop of the current season are differentiated during late May and early June on wood that was formed during the spring of the same season. Hence the failure of this kumquat to differentiate blossom buds in great numbers in early spring is generic in cause.

Walnut production in Oregon, C. E. Schuster (*Oregon Sta. Circ. 108 (1934), pp. 38, figs. 13*).—This is a revision of an earlier circular (E.S.R., 61, p. 442) and in a like manner presents general information as to soil and climatic requirements, varieties, planting, pollination, culture, control of pests, etc.

The oriental flowering cherries, P. Russell (*U.S. Dept. Agr. Circ. 313 (1934), pp. 72, figs. 32*).—This, a revision and enlargement of an earlier circular (E.S.R., 59, p. 142), presents historical, cultural, botanical and practical information on the oriental flowering cherry. The drawings were made by B. Y. Morrison. The statement is made that these cherries are of about equal hardiness as the peach.

[Notes on the violet tree, Phlebotaenia cowellii], N. L. Britton (*Puerto Rico Sta. Agr. Notes 66 (1934), pp. 2*).—In connection with records on germination there is offered information on the tree itself, its soil preferences, character of the wood, etc.

Flower gardens for Colorado, G. A. Beach (*Colorado Sta. Bul. 408 (1934), pp. 20, figs. 5*).—General information is presented on soil preparation and care, varieties, methods of planting, pruning and training, control of insects and diseases, etc.

Production of early blooms of chrysanthemums by the use of black cloth to reduce the length of day, K. Post (*[New York] Cornell Sta. Bul. 594 (1934), pp. 30, figs. 7*).—In presenting this more complete account of studies previously noted (E.S.R., 70, p. 631), the author sets forth the data in detail showing that chrysanthemums of both large-flowered and pompon types may be forced into bloom as much as 70 days before their normal season by reducing the length of day to 11 hr. by shading with black cloth.

The discontinuance of short-day treatments before the buds were selected on disbudded plants and before color was showing in the pompons caused the buds to cease further accelerated development until the length of day was of proper length for flowering. The alternation of short and long days in various sequence caused buds to form, but the flowering was delayed by the full days included in the schedule. Crown buds started to develop under long-day conditions, while terminal buds developed under short days. It is conceded possible that there is no essential difference between the two types at the time of their formation, but that the crown bud is nothing more than a terminal bud differentiated under short-day conditions and developed to some extent under long-day conditions.

Factors affecting gladiolus in storage, J. I. Lauritzen and R. C. Wright (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 3, pp. 265–282, fig. 1*).—Working with several varieties of gladiolus corms, there was found in these studies, carried on at Arlington Experiment Farm, Va., a tendency for moisture losses to increase in storage as the relative humidity of the chambers was decreased. As related to temperature, there was a greater moisture loss at 0° C. than at 4.5°. Rooting and sprouting tended to increase with rising temperature and rising relative humidities, but there was no marked tendency for yield of plants or production of flowers following storage to be correlated with storage temperature or humidity. In all varieties the total percentage yield of corms was greater where the parent corms had been stored at 0° than at 10°, indicating that the storage temperature may have exerted some influence.

Unwounded corms of all varieties tested showed little infection by *Penicillium gladioli* at any of the three temperatures or humidities utilized. However, in a lot of Maiden Blush subjected to rough treatment prior to storage there was a high percentage of infection in all the various environments. Apparently infection depended on the presence of unhealed lesions and was limited in development when storage conditions favored suberization or periderm formation. Low relative humidities of from 63 to 75 percent at temperatures of 0° to 4.5° practically eliminated infection.

Observations on the growth of plants resulting from corms which had been stored for 10 days at various temperatures ranging from 12.5° to 37° indicated that a range of from 22° to 31° may be employed to prevent infection and loss of moisture from unhealed wounds.

Growth responses of the gladiolus as influenced by storage temperatures, D. C. Fairburn (*Iowa Sta. Res. Bul. 170* (*1934*), *pp. 93–123, figs. 6*).—Determinations of the respiration rate of gladiolus corms stored at constant temperatures of 0°, 5°, 10°, 21°, and 32° C. (89.6° F.) showed variations not only with the season but with varieties. The early-maturing variety Souvenir respired more rapidly than the late-maturing Giant Nymph. Considerable shrinkage occurred during dormancy, particularly at the higher temperatures.

Compositional variations, especially in reducing and nonreducing sugars, occurred during storage. An accumulation of sugars at low temperatures, particularly 0°, is believed the result of diminished respiration. Starch content was high, ranging from 9 to 14 percent of the fresh weight. Nitrogen content remained fairly constant at the low temperatures, but at high points rose consistently during the dormancy of the Souvenir variety and fluctuated in Giant Nymph.

Cytological studies of corms during storage and later failed to show flower differentiation in the storage period; in fact, the primordia were not observed until 3 to 4 weeks after the time of planting. High storage temperatures resulted in more rapid development of the young plants and earlier differen-

tiation of the flower parts. The primordia emerged from the new corm and appeared only indirectly associated with the mother corm.

As to the effect of storage temperature on general growth of the plants, temperatures below 5° were unsatisfactory from the standpoint of flower production and vigor. Storage at 10° was superior to 5°, and excellent spikes and early bloom were secured from corms of both varieties stored at 32° and forced in the greenhouse.

Hastening the germination of dormant gladiolus cormels with vapors of ethylene chlorhydrin, F. E. Denny and L. P. Miller (*Contrib. Boyce Thompson Inst., 6 (1934), No. 1, pp. 31–38*).—Cormels of five different varieties of gladiolus, after being sorted into four different sizes (varying in weight from 50 to 500 mg per cormel), were treated with vapors of ethylene chlorohydrin at once after harvest and at intervals of 3 to 4 weeks thereafter until April or until untreated cormels gave good germination without treatment. Sprouting of cormels was hastened by the use of from 3 to 5 cc of 40 percent ethylene chlorohydrin per liter of air space within a closed container for a period of from 3 to 5 days. With the varieties Souvenir and Alice Tiplady about 60 to 90 days were gained in the time required to reach a certain stage in germination (50 percent for Souvenir and 30 percent for Alice Tiplady). With Remembrance, although germination percentages as high as 50 or even 30 were seldom reached by untreated lots, the gains in treated lots were 100 to 180 days, or more.—(*Courtesy Biol. Abs.*)

History, culture, and varieties of summer-flowering phloxes, A. M. S. Pridham (*[New York] Cornell Sta. Bul. 588 (1934), pp. 32, figs. 18*).—Stating that all species of *Phlox* except one, *P. siberica*, are natives of North America, the author discusses the botany and history of the genus, their culture, propagation, control of diseases and pests, horticultural varieties, etc.

Gradient composition of rose shoots from tip to base, H. B. Tukey and E. L. Green (*Plant Physiol., 9 (1934), No. 1, pp. 157–168, figs. 6*).—Shoots taken from potted plants of *Rosa multiflora*, all the progeny of a single parent and grown at the New York State Station in soil with high nitrogen and in sand with no added nitrogen, showed a gradient of increasing moisture, ash, and total nitrogen and a gradient of decreasing starch from the base to the tip. With respect to nitrogen treatments, the shoots from high-nitrogen plants showed higher moisture, ash, and total nitrogen and lower starch throughout their length. The range in starch on a dry weight basis was from 4.71 to 12.36 percent and of total nitrogen from 0.407 to 2.4 percent. Starch accumulated first in the xylem parenchyma, followed in order by the xylem rays, perimedullary zone, and cortex parenchyma. Starch was found in small amounts in the phloem and rarely in the cambial zone.

FORESTRY

[Forestry studies by the Ohio Station] (*Ohio Sta. Bul. 532 (1934), pp. 97–101, 104, 105, figs. 5*).—Brief accounts are presented of the emergency conservation activities, by E. Secrest; of work on the State forests, by O. A. Alderman; of reforestation, by Secrest; and of forest classification, by R. R. Paton.

Yield of second-growth western hemlock-Sitka spruce stands in southeastern Alaska, R. F. Taylor (*U.S. Dept. Agr., Tech. Bul. 412 (1934), pp. 30, pl. 1, figs. 13*).—Studies conducted on 288 sample plats in even aged normally stocked second-growth stands indicated that stands 100 yr. of age had an average height of dominant trees of 100 ft. and are capable of yielding

ft. per acre. Second-growth spruce and hemlock had different trends in growth from early life to maturity. For example, at 12 in. in diameter hemlock exceeds spruce in height growth, whereas at 24 in. and thereafter the spruce surpasses the hemlock.

On the basis that pulpwood operations utilize trees 7 in. or more in diameter, it is conceded that at 70 yr. most of the trees would be above this minimum, except on low quality sites. In presenting the various tables for different ages and different site indexes, the author points out that, in applying the tables over large tracts of second growth, cruises will be necessary to determine the various sites and reductions. The tables are said to be of little use in all-aged virgin forests, which now cover a greater portion of the region.

The experimental production and the diagnosis of frost injury on forest trees, W. R. Day and T. R. Peace (*Oxford Forestry Mem. 16 (1934), pp. 60, pls. 10, figs. 5*).—Potted plants ranging from 2 to 5 yr. of age were subjected to low temperatures in a freezing chamber. With the species used, European, Japanese, and Siberian larches, Douglas fir, Sitka and Norway spruces, Scots pine, *Thuja plicata*, beech, and oak, the minimum temperature utilized (10° F.) was not low enough to cause damage during the period of dormancy. Douglas fir and Sitka spruce stood out as the species most susceptible to autumn damage, while Douglas fir and Scots pine were most susceptible to winter cold. European and Japanese larches, Douglas fir, and *T. plicata* were most easily injured by early spring frost and Douglas fir and *T. plicata* by midspring cold.

In general the results secured in the chambers agreed with those anticipated from field observations. Furthermore, an examination of the injuries showed them to be similar to those occurring in nature. Douglas fir, found susceptible over such a long period, demands particularly careful attention as to location of site. The nature of the freezing injury produced in the chambers and the possible relation of such injuries in nature to canker and other diseases are discussed.

DISEASES OF PLANTS

The Plant Disease Reporter, December 15, 1933 (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 17 (1933), No. 15, pp. 177–185*).—This issue contains an article by F. L. Wellman on pathological effects of the east wind in Florida (on cucurbits, peppers, green beans, garden peas, early celery, and late celery); also notes on diseases of canning crops (snap beans, lima beans, sweet corn, peas, and tomatoes) in Maryland in 1933; notes on diseases of cereals and grasses in Oregon and Washington in 1933; notes on some diseases of nut trees in Oregon; and a report of strawberry leaf variegation on the Bitter Root variety in Arkansas.

Plant pest handbook for Connecticut.—II, Diseases and injuries, G. P. Clinton (*Connecticut [New Haven] Sta. Bul. 358 (1934), pp. 149–329+XI–XXVI, figs. 55*).—A discussion of the general nature of infectious and noninfectious disorders of plants and of the agencies producing them is followed by an explanation of different preventive measures. The principal diseases and injuries of cultivated plants under Connecticut conditions are then described briefly, with control suggestions where applicable, and with clear-cut illustrations of some of the more important ones. The arrangement of this material is alphabetical by the common name of the host.

Twenty-five pages near the end are devoted to a somewhat longer discussion of certain disorders on which the author has done special work or which claim particular attention by reason of their newness or special importance. These

include ash canker, asparagus fasciation, cherry brown rot, bacterial wilt of corn, black spot of dill, Dutch elm disease, dry rot of gladiolus, toadstools on lawns, bacterial blight of lilac, gray mold of lily, drought injury of oak, gray mold and smut of onion, peach yellows, fire blight of pear, black wilt of periwinkle (myrtle), persimmon scab, leaf spots of phlox, potato late blight, raspberry leaf curl and mosaic, rose crown gall and leaf blotch, bacterial black rot and mosaic of rutabaga, damping-off and downy mildew of spinach, mosaic (calico) and fertilizer injury of tobacco, tomato late blight, *Botrytis* blight (white spot) of tulip, white pine blister rust, and willow scab.

Formulas for preparing fungicides are included at the end. The index lists the causal agencies only, using the scientific names wherever possible. This bulletin composes the second part of the handbook (E.S.R., 69, p. 231).

Botany and plant pathology (*Ohio Sta. Bul. 532 (1934), pp. 33–38, fig. 1*).—The 1933 results are noted of experiments on apple scab and Bordeaux substitute sprays, both by H. C. Young; raspberry disease control by Young and [H. F.] Winter; potato spraying experiments, by P. E. Tilford; influence of cucumber sprays and dusts on vine size and yield, addition of oil to Bordeaux mixture to reduce drying effect, and resistance of celery varieties to yellows, all by J. D. Wilson; breeding a tomato variety resistant to leaf mold, by L. J. Alexander; seed treatment for the control of Stewart's disease, by R. C. Thomas; nematode disease of peonies, by Tilford; the Dutch elm disease, by Young; and pine canker, by C. May.

[Plant disease studies in Rhode Island] (*Rhode Island Sta. Rpt. [1933], pp. 71, 89–92*).—Results are briefly noted of tests of seed treatment (of vegetables) and of disease control (of brown patch and dollar spot on bent grasses). A special article, by L. E. Erwin, reports on a grass-destroying fungus (*Corticium fuciforme*) new to America.

Report of the seventeenth annual meeting of the Pacific division of the American Phytopathological Society (*Phytopathology, 23 (1933), No. 11, pp. 928–930*).—Abstracts of the following papers are given: The Dieback Form of Tomato Streak, by M. Shapovalov (p. 928); Some Improvements in Auto-Irrigator Apparatus, by L. A. Richards and H. L. Blood (pp. 928, 929); Some Inoculations with *Dothiorella ribis*, by C. O. Smith (p. 929); Biochemical Changes Accompanying Curly Top of Tomato, by F. B. Wann and H. L. Blood (p. 929); The Effect of Vitamins on the Growth of Fungi in Pure Culture, by W. G. Solheim, S. S. Sears, and R. C. Rollins (pp. 929, 930); Studies of Psyllid Yellows of Tomato, by H. L. Blood, B. L. Richards, and F. B. Wann (p. 930); and New Symptoms of Psorosis, Indicating a Virus Disease of Citrus, by H. S. Fawcett (p. 930).

A revised list of plant diseases occurring in South Africa, compiled by E. M. Doidge and A. M. Bottomley (*So. Africa [Dept. Agr.] Bot. Survey Mem. 11 (1931), pp. 78, fig. 1*).—This revision is based on a preliminary check list of plant diseases occurring in the Union of South Africa published in 1924, with corrections and additions. The arrangement is by hosts, with notes on distribution and severity.

Inspection of the plant health situation in northern Kivu [trans. title], L. L. van Roechoudt (*Rev. Agrol. et Bot. Kivu, No. 3 (1933), pp. 28–30*).—This contains a report on diseases of physiologic and parasitic origin, with brief notes on control measures.—(*Courtesy Biol. Abs.*)

Studies on Armillaria mellea (Vahl) Quel., infection, parasitism, and host resistance, H. E. Thomas (*Jour. Agr. Res. [U.S.], 48 (1934), No. 3, pp. 187–218, pls. 11*).—A histological investigation at the California Experiment Station of the mode of entrance of *A. mellea* into susceptible (e.g., peach, Persian walnut, myrobalan plum, carrot, potato, and parsnip) and resistant

(e.g., northern California black walnut, French pear, and dahlia) roots and tubers revealed the fact that the fungus entered the roots studied regardless of the resistance or susceptibility of the host. The test plants were grown in boxes filled with an unsterilized mixture of sand and soil artificially inoculated with a pure culture of the fungus growing on pieces of wood. To avoid root injury through transplanting, seed was ordinarily used.

The method of entry employed by the fungus was the same for all the hosts examined. Invasion of the root is accomplished by the direct penetration of a branch of the parent rhizomorph through the sound, healthy periderm. The rhizomorph branch enters the root as a unit and not as separate hyphae, and in so doing appears to employ both mechanical and chemical means. As if acted upon by a suberin-dissolving enzyme, some destruction takes place in the suberized walls of the periderm as the rhizomorph branch penetrates. After entry has once been gained the fungus grows rapidly in susceptible roots and causes general destruction, while in resistant roots growth is soon checked and the wound corked out. A secondary cork layer often forms in advance of the fungus but has doubtful significance as a factor pertaining to resistance, since the rhizomorph readily breaks through such a layer.

The ability of the fungus to grow on the expressed sap of different roots indicates there is very little correlation between this and the resistance or susceptibility of the host. Structural or morphological differences of the host appear to play no part in resistance, which seems to be of the nature of an antagonistic influence exerted upon the fungus by the host only when the latter is in an active, healthy state.

The influence of artificial cultivation on the behavior of the conidia of Cladosporium fulvum [trans. title], L. S. AGERBERG, M. SCHMIDT, and R. v. SENGBUSCH (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 21 (1933), No. 3, pp. 511–513*).—*C. fulvum* spores from tomato leaves were longer and narrower than those from glucose agar culture. Culture spores formed knotty, much branched hyphae when grown in tomato leaf or potato leaf decoction, whereas the leaf spores formed long, slightly branched hyphae when grown in these decoctions. It is suggested that the "knotty" growth from the germinated culture spores is due to their being more sensitive to solanine poison. Viable culture spores could not be made to infect the leaves of living tomato plants. Whether the reaction of the culture spores to the leaf decoctions and to the living plants is due to a sensitiveness to the same factor or factors was not determined.—(*Courtesy Biol. Abs.*)

Resistance to mosaic (*Puerto Rico Sta. Rpt. 1933, pp. 7, 8*).—The results of a survey of the Mayaguez 28 variety of sugarcane are presented.

Certain Sclerotium diseases of grains and grasses, R. REMSBERG and C. W. HUNGERFORD (*Phytopathology, 23 (1933), No. 11, pp. 863–874, figs. 4*).—Diseases of grains and grasses produced by several sclerotial fungi which appear in the field after the snow melts have been increasing in occurrence and importance in the high altitude regions in Idaho during the last few years. Fourteen cultures have been obtained of these organisms, whose optimum temperatures for growth range from 0° to 10° C. Although attempts have been made to obtain the perfect stage, they have not been successful. These 14 isolation strains have been placed in 4 groups according to their morphological and physiological characteristics. One of these groups corresponds in growth characteristics to a culture of *Typhula graminum* supplied by H. Tasugi of Japan. Pathogenicity of several of these organisms has been established both by laboratory and field inoculations conducted at the Idaho Experiment Station. The disease is best controlled by late planting, but also by using resistant varieties of cereals.

Tumor problem in the light of researches on plant tumors and galls and its relation to the problem of mutation, D. Kostoff (*Protoplasma, 20 (1933), No. 3, pp. 440–456*).—The author discusses the problem of plant tumor formation in hybrids and the strong precipitation reaction between the extracts of parent stocks whose F_1 offspring are active formers of noninfectious galls. The characteristics of insect galls, including mitotic phenomena, and the characteristics of plant galls due to bacteria, as well as the cytological and biochemical similarities between plant tumors and animal cancer, are brought out. Various hypotheses are outlined as to the etiology of such overgrowths. Chromosomal aberration and gene mutation are questioned as possible causes. The theory of the formation of reducts by despecification of certain cells due to the action of chemicals or other agents is presented. Its possible relation to tumor formation is regarded as worthy of further study.

Beneficial fungi, C. M. Haenseler (*N.J. Agr., 16 (1934), No. 2, pp. 6, 7*).—Experiments under way showed the antagonistic action of a species of *Trichoderma* toward the damping-off fungi *Rhizoctonia* and *Pythium* when a culture of the former was added to cucumber seed beds contaminated by either fungus. It was found that *Trichoderma* produces a substance directly toxic to *Rhizoctonia*. This substance is destroyed by heating to 80° C. for 10 min., by aging for 10 days, or by 5-minute exposure to pure oxygen.

The fungicidal properties of certain spray-fluids, VIII–X, H. Martin and E. S. Salmon (*Jour. Agr. Sci. [England], 21 (1931), No. 4, pp. 638–658; 22 (1932), No. 3, pp. 595–616; 23 (1933), No. 2, pp. 228–251, figs. 2*).—Continuing the series (E.S.R., 68, p. 340), three papers are presented.

VIII. *The fungicidal properties of mineral, tar, and vegetable oils.*—In a search for a substitute for sulfur in the control of powdery mildews, a number of mineral oils, tar oils, and vegetable oils were tested in a limited way in 1930 on greenhouse-grown hop vines attacked by *Sphaerotheca humuli*.

The mineral oils tested were fungicidal at strengths used, except that liquid paraffin 2 percent emulsions did not always completely suppress the mildew. Foliage injury occurred at times, indicating that there is not a wide margin between toxic action on the fungus and danger to leaf tissue. There was no evidence that ease of breaking of an emulsion affects fungicidal properties. The authors question the usefulness of employing any type of mineral oil solely as a fungicide.

Neutral tar oils proved injurious to leaves when toxic to mildew.

Cottonseed oil, olive oil, and sesame oil at 0.5 percent, rape oil at 2 percent, peach kernel oil at 1 percent, and castor oil at 4 percent all effectively destroyed the mildew when they were emulsified with 0.5 percent soft soap, without causing foliage injury.

IX. *The fungicidal properties of the products of hydrolysis of sulphur.*—Sprays containing various sulfur compounds were applied to the conidial stage of *S. humuli* on hop leaves growing in an unheated greenhouse. Soft soap, gelatin, and Agral I were used as spreaders. The fungicidal activity of sulfur as sulfite, hydrosulfite, sulfoxylate, thiosulfate, or monosulfide is deemed insufficient to account for the action of elementary sulfur on the organism. The fungicidal properties of solutions of sodium sulfide, sodium hydroxide, and sodium carbonate are due to the alkalinity of the sprays. The active fungicide produced by the hydrolysis of sulfur is polysulfide sulfur. The action of Agral I in promoting the fungicidal action of sulfur may be due to its enhancement of the fungicidal activity of polysulfide sulfur. Direct fungicidal action of polysulfide solutions is due to the polysulfide sulfur as such.

X. *Glyceride oils.*—The fungicidal action of vegetable oils on the conidial stage of the hop powdery mildew (*S. humuli*) is a property common to glyceride

oils. "When applied with 0.25 percent Agral I, the various samples of vegetable and animal oils examined, with the exception of castor oil, proved fungicidal at a concentration of 0.5 to 1 percent. The fungicidal action of glyceride oils is associated with the glyceride structure and, in the presence of Agral I, is unaffected by the presence of those impurities of the oil which are removed by refinement. Glycerol at 4 percent is not completely fungicidal, and, under the conditions of the experiments, causes leaf injury; oleic acid at 1 percent is phytocidal; triolein, prepared by synthesis from glycerol and oleic acid, is fungicidal at 0.5 percent and causes no injury to the leaves. The fungicidal properties of glyceride oils are affected by the type of emulsification used, and the stable emulsions produced by the two-solution oleic acid method are less effective than the unstable emulsions obtained by agitation with dilute Agral I solutions. Emulsifiers alkaline in reaction or which require the addition of alkali are unsuitable for the preparation of fungicidal sprays containing glyceride oils. For this purpose Bordeaux mixture is shown to be suitable."

Capacity of germination of uredospores of grain rusts [trans. title], C. BRUSCHETTI (*Riv. Patol. Veg., 23 (1933), No. 1–2, pp. 33–36*).—Two cases are cited in which uredospores were found in the winter on early fall-sown wheat, in one case causing death of the plants. Leaves of *Festuca elatior* covered with ice for several days bore well preserved spores which gave a high percentage of germination. Uredospores of *Puccinia graminis* kept in frozen hanging drops at −3° [C.] for 24 hr. gave 63 percent germination when removed to a thermostat at 23°. When hanging drops containing uredospores from Carosello wheat were kept at −15° for 15 hr. no germination occurred when they were removed to a favorable temperature. When culms bearing uredospores were subjected to the same conditions and spores later mounted in water 30 percent germinated (70 to 80 percent in the controls). Light and darkness had no effect on the percentage of germination, though spores germinated better in rain water than in distilled water.—(*Courtesy Biol. Abs.*)

The stem rust control program, F. C. MEIER (*Jour. Econ. Ent., 26 (1933), No. 3, pp. 653–659, fig. 1*).—A discussion is given of the gain in rust control by the eradication of barberry bushes.

Experiments on the control of oat rusts by sulphur dust, F. J. GREANEY (*Sci. Agr., 13 (1933), No. 7, pp. 426–434, figs. 2, Fr. abs., p. 471*).—In 1929 and 1930 field experiments were made at Winnipeg, Man., to determine the effectiveness and practicability of controlling stem rust and crown rust of oats with sulfur dust. The Latin Square type of randomized experiment was employed, and the "analysis of variance" method was used in analyzing the yield data. In 1930 a study was made of the effect of these rusts on the yield of oats. Stem rust and crown rust were effectively prevented by dusting, even in the presence of severe infestations. In 1929, a mild rust year, 30-lb. applications of sulfur made at 7-day intervals (4 dustings) completely controlled rust. Severe epidemics of both oat rusts occurred at Winnipeg in 1930. In that year the best control of rust was achieved by 30-lb. applications made at intervals of 2 days from July 16 to August 22. By such treatments the yield of Victory oats was increased by 45 bu. per acre, or about 153 percent.

The results of studies to determine the effect of rust on the yield of oats are given in the form of correlation coefficients and regression equations. The regression of yield on percentage rust was linear, indicating that uniform increases in rust infection result in uniform reductions in yield. Under field conditions in 1930, each 10 percent of stem rust reduced the yield of oats approximately 7 percent. Crown rust was found also to be significantly associated with yield.

Observations on the physiological characters of Phoma glumarum, the causal fungus of grain blight of rice plant [trans. title], H. Chu (*In 1932 Year Book, Hangchow, China: Bur. Ent., 1933, pp. 192–198, figs. 2; Eng. abs., p. 192*).—The rice grain blight (*P. glumarum*) is very prevalent in Chekiang, especially in Hangchow, Siaoshan, etc., where it caused a loss of 25 percent in 1932. This paper treats merely on physiological characters which may serve as means for its control.

Methods of inoculation of wheat with Helminthosporium sativum P.K. and B, B. J. Sallans (*Sci. Agr., 13 (1933), No. 8, pp. 515–527, fig. 1*).—A study was made of methods of inoculation of wheat with *H. sativum* for production of seedling infections. Age of culture, when grown on oat hull medium, affects degree of infection in inoculated seedlings. Young cultures up to 2 weeks produce maximum infection. Addition of sterile medium or sterilized inoculum to the checks resulted in severe injury to wheat seedlings, causing nonemergence when used in unsterilized soil. No marked injury was produced in sterilized soil. Seed treated with a spore suspension was found on drying to give higher disease ratings than when sown while still wet. This was shown to be due to a period of incubation when the spores germinated before drying was complete. It was found that by increasing the period of incubation to 18 to 27 hr. at 24° C. a high percentage of infection could be obtained. It was suggested that uniform inoculations may be obtained by this method if the technic is standardized.

Further studies on amputations of wheat roots in relation to disease of the root system, P. M. Simmonds and B. J. Sallans (*Sci. Agr., 13 (1933), No. 7, pp. 439–448, figs. 5; Fr. abs., p. 471*).—Seminal root amputations during the seedling period are injurious as indicated by a reduction in yield and a tendency towards delayed maturity. The severance of the subcrown internode during this time is likewise harmful. Crown root amputations, on the other hand, cause little reduction in yield but appear to encourage the maturing processes. During the seedling period and up to about midseason the seminal roots constitute the chief absorbing system and appear to be the most important. Amputations of them cause severe injury early in the season, with decreasing severity as the operations are made later. The reactions caused by crown root amputations are quite the opposite, with the severest injury after midseason, when apparently these roots become the principal absorbing system. Crown root amputations, however, just before maturity are less injurious than those made previous to that time. At midseason the seminal and crown root systems are of equal importance. The potentialities of the wheat plant to replace amputated crown roots are well demonstrated when crown roots are cut off at weekly intervals. Furthermore, the plant may produce seed when dependent almost entirely upon the seminal roots.

The interpretation of some of the results in their application to a better understanding of root diseases is briefly discussed.

Factors affecting the severity of take-all.—II, Soil temperature, S. D. Garrett (*Jour. Dept. Agr. So. Aust., 37 (1934), No. 7, pp. 799–805, figs. 5*).—This continues work previously reported (E.S.R., 71, p. 52). It describes experiments confirming the work of Henry (E.S.R., 71, p. 51) on the effect of soil temperature on infection of wheat seedlings by *Ophiobolus graminis*. When other soil micro-organisms were practically excluded by use of sterile silica sand, with seed inoculation, infection by *O. graminis* increased steadily with rise of temperature from 12° to 24° C., the optimum temperature for growth of the fungus in pure culture. Degeneration of *Ophiobolus* inoculum in soil was much more rapid at 25° than at 12°.

It is suggested that in soils with poor microbiological content, such as the Mallee sands, take-all infection is accelerated by rise of temperature, and that this is a factor contributing to the late appearance of the disease in some seasons when primary soil infection does not show up until the crop is already in ear.

The use of formaldehyde on outside vegetables, J. D. WILSON (*Ohio Veg. Growers' Assoc. Proc., 18 (1933), pp. 120–125*).—This contribution from the Ohio Experiment Station reports that formaldehyde (1–128) at the rate of 1 gal. to 200 ft. of row (or formaldehyde dust made by adding 4.5 percent of commercial formalin to some carrier like infusorial earth or fine charcoal applied at the rate of 1 lb. to 400 ft. (or with more resistant seeds 300 ft.) of row) gave very beneficial results against "damping-off" diseases of certain vegetables. The number of plants in formaldehyde-dust treated rows for every 100 plants in untreated rows was for spinach 422, beet 151, bean 145, and pea 140, but for seed more sensitive to formaldehyde poisoning, as lettuce, there were only 45 plants in the treated row. The liquid gave slightly better results than the dust in muck, but in loam the opposite was true.—(*Courtesy Biol. Abs.*)

Cabbage clubroot in muck soils, J. D. WILSON (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 58–65, fig. 1*).—A review of the clubroot (*Plasmodiophora brassicae*) situation in Ohio and a summary of the results of the work of various investigators, looking forward to control, are followed by a discussion of greenhouse and field experiments conducted to find, if possible, a practical way of suppressing the disease in acid muck soils. Cabbage grown in such soils is not protected adequately against infection by the use of hydrated lime in amounts (from 1 to 4 tons per acre) which usually give fair control of the disease on upland (mineral) soils.

It was found that the highly buffered condition of the muck soils rendered the hydrated lime relatively inefficient in raising the pH and in suppressing infection. Although thorough incorporation of hydrated lime into muck soil at the rate of 5 or 6 tons per acre produced fair protection in the greenhouse tests, it did not produce anything like satisfactory control at the same rate of application in the field trials. Nine other chemical materials were tested out, including quicklime, sulfur, $HgCl_2$, and $CuSO_4$, in various strengths, but none equalled hydrated lime in effectiveness. It is concluded that satisfactory control of the disease cannot be expected in muck land through the use of any of the materials tested, hydrated lime being no exception.

Infections were found to be nearly as severe in seedlings of cabbage grown in soil from 9 to 12 in. depth in contaminated muck land as in those grown in soil from near the soil surface.

The spermatia of corn rust, Puccinia sorghi, R. F. ALLEN (*Phytopathology, 23 (1933), No. 11, pp. 923–925, fig. 1*).—This contribution from the California Experiment Station reports that in the haploid generation of corn rust on *Oxalis*, if spermatial exudate is transferred back and forth among the infections and the plant then placed in a damp chamber, spermatia become attached to the paraphyses and the spermatial nuclei enter the paraphyses. Under these conditions too, spermatia on the leaf surface germinate, forming delicate hyphae of limited growth.

Cumin powdery mildew in Bombay, B. N. UPPAL and M. K. DESAI (*Bombay Dept. Agr. Bul. 169 (1932), pp. 16, pls. 4*).—Results of the investigation into powdery mildew of cumin (*Cuminum cyminum*) carried out in Bombay from 1928 to 1932 show its seriousness to be greatly modified by the character of the season. In favorable seasons the disease assumes epidemic proportions and may cause total crop failure. The phenological relations of this mildew are

discussed. Temperature is the most potent factor influencing its growth. It develops with extreme rapidity at from 80° to 95° F., but temperatures below 80° are unfavorable. Irrigation water increases atmospheric humidity, which favors development of mildew. Proof of the perennation of the organism as dormant mycelium on the seed was established experimentally. The organism is referred to *Erysiphe polygoni*. Cumin is thus a new host. Sulfur dust has given the most effective control.

The lima bean scab situation, W. A. McCubbin (*Jour. Econ. Ent., 26 (1933), No. 3, pp. 625–630*).—Lima bean scab, due to the fungus *Elsinoe canavaliae*, is a disease confined to this host. It is probably endemic in the Central American and West Indian regions, and is not known to occur in the United States. Being a well-specialized parasite, the fungus does not seriously injure its host, the outstanding damage arising from disfigurement of the pods. The evidence points to interseason carry-over on living plants and to spread by wind. Temperature and moisture relations in Cuba indicate that it might be troublesome in at least some of our lima bean areas. Its relation to a long winter and frost are unknown, and these might be limiting factors in the north.

Successful control by spraying requires numerous applications involving excessive cost. The chief danger of introduction lies in the discarded pods, which may reach the fields by way of garbage. Point-of-origin inspection and certification is unsatisfactory, as it throws out too much of the crop and yet allows considerable scab infection to remain. Importation of lima beans in the shelled condition under refrigeration in transit would assure adequate protection, and is regarded as a commercial possibility.

Isolated tuber-unit seed plots for the control of potato virus diseases and blackleg in northern Maine, E. S. Schultz, R. Bonde, and W. P. Raleigh (*Maine Sta. Bul. 370 (1934), pp. 32, pls. 8, figs. 2*).—The results of tests extending from 1926 to 1931, involving eight different places and including Green Mountain, Bliss Triumph, Irish Cobbler, and Rose 4, showed that certain potato virus diseases could readily be held in check and in some cases even eliminated by the use of seed plats located at a distance from other growing potatoes, planted in tuber units, and rogued four times, under the conditions in northern Maine. The plants were inspected one row at a time, and all abnormal individuals were removed with their seed pieces and any young tubers, these being disposed of in such a way that insects could not escape to healthy plants. The first roguing was made as soon as symptoms appeared, when the plants were up 2 to 6 in., the second was given about 10 days later, the third when the plants bloomed, and the last a few weeks later before the plants were frosted.

Mild mosaic was more difficult to control in this way than leaf roll or spindle tuber, and the results varied from plat to plat and season to season, presumably due to the variable activity of insect carriers and the proximity of sources of infection in the vicinity. The relative abundance of different vectors in northern Maine is mentioned, and the effect of this on the rate of increase of different virus diseases is discussed.

Clearings in the woods gave somewhat better results than open fields for the seed plat location. On one representative farm, in 6 yr. of following this method, virus diseases never got beyond 7 percent, while in a nearby unrogued field they increased to 91 percent in 2 yr. Without seed plat roguing, increase of mild mosaic in 2 yr. reduced potato yields about 18 percent or 27 bbl. per acre on one farm.

The advantages and disadvantages of planting tuber units by hand, with an automatic cutting and planting machine, or with a two-man planter are dis-

cussed. The planting of fresh-cut seed pieces, as is usual in tuber-unit planting, results in more effective prevention of blackleg than all other methods tried by the authors.

On the relation between the stage of development of the potato crop and the incidence of blight (Phytophthora infestans), A. Beaumont (*Ann. Appl. Biol., 21 (1934), No. 1, pp. 23–47*).—The opinion is commonly held that potato plants above a certain age are more susceptible to blight than young plants. This is based on (1) general field observations, (2) dates of planting experiments, and (3) artificial inoculation experiments. It is shown that this evidence really indicates a difference in "epidemic potentiality", not in inherent susceptibility. Epidemic potentiality depends not only on susceptibility but also on the number of centers of infection and the external conditions. Experiments in different parts of England in 1929, 1930, and 1931, in which potato plants were planted at fortnightly intervals and the amount of blight in each plat observed daily, are shown to favor this new interpretation. Artificial inoculation experiments, which alone might give an unequivocal answer to the problem if properly carried out, have given conflicting results.—(*Courtesy Biol. Abs.*)

On treating seed potatoes for the control of common scab, G. B. Sanford (*Sci. Agr., 13 (1933), No. 6, pp. 364–373, pls. 2; Fr. abs., p. 409*).—A comparison was made of the efficiency of certain common disinfectants and fungicides for treating seed potatoes to prevent common scab caused by *Actinomyces scabies*. "Hot formaldehyde, cold formaldehyde, $HgCl_2$, or Bayer No. 649 used as soak treatments produced no perceptible effect in reducing common scab on the resulting crop in field culture. In sterilized soil of optimum moisture content, *A. scabies* grew vigorously and practically in contact with cores of potatoes treated with hot formaldehyde, cold formaldehyde, $HgCl_2$, or Bayer No. 649 solutions, as with those coated with sulfur, Semesan Bel, or Bayer No. 649 dusts. The planting of untreated scabby sets did not increase the amount of scab on the resulting crop. When sets were coated with a virulent culture of *A. scabies*, only a slight amount of scab appeared on the new crop and then only on a few of the tubers which grew close against the old inoculated set. When sets were planted in soil culture of *A. scabies*, only that part of any tuber which grew in the inoculated soil area was covered by scab. It is concluded that the methods now recommended for disinfecting seed potatoes to reduce common scab on the resulting crop are of no practical value under ordinary field conditions. It is also contended that the relative efficiency of one tuber treatment over another cannot be demonstrated under ordinary field conditions. The question is raised whether the amount of the scab pathogen in the soil is augmented by the planting of scabby, untreated potato sets beyond the increase which normally occurs."

Status of potato wart in 1932, R. H. Bell (*Jour. Econ. Ent., 26 (1933), No. 3, pp. 649–652*).—Potato wart was introduced into the United States, presumably from Europe, about 1912, but was not discovered until 1918. To date, infection has been found in three States, Pennsylvania, Maryland, and West Virginia. Introduction seems to have resulted from potatoes imported and distributed through company stores to various mining districts, where many gardens but few farms are known to harbor the disease.

Control has been through enforcement of a quarantine which permits planting of immune varieties only, and prohibits movement of potatoes and various other carriers out of the restricted areas. Very few additional infections have been found since the original survey, indicating that the quarantine has been effective. Investigations by the Pennsylvania Department of Agriculture have revealed that infection persists in the soil after a lapse of 13 yr. in potato

growing; that thorough cultivation for 6 yr. tends to reduce, but has not eliminated wart; that very little, if any, wart develops above 70° F. soil temperature; and that certain new soil sterilizing materials look promising for use in connection with administration of the wart quarantine.—(*Courtesy Biol. Abs.*)

The relation of "dark center" to the composition of rutabagas, E. B. Holland and C. P. Jones (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 4, pp. 377, 378*).—In this contribution from the Massachusetts Experiment Station it is stated that the apparently functional disorder of rutabagas, due probably to environmental factors, known as dark center, "mottled heart", "water core", etc., has become so prevalent in certain sections of Massachusetts as to destroy the marketability of a large proportion of the crop. Samples were submitted to the laboratory for examination and on analysis showed a substantial loss in nitrogen-free extract, particularly sugars, with an increase of protein, fiber, and ash as a result of the initial stages of the disorder.

Cercospora leaf spot of sugar beet and its control [trans. title], H. L. Werneck (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz, 11* (*1933*), *No. 8, pp. 183–188*).—Sugar beet yields in 1932 were greatly reduced in Oberösterreich (Upper Austria), in part due to drought but attributed for the most part to an epidemic of *Cercospora* leaf spot. The author observed during the epidemic years of 1929 and 1932 that timely applications of nitrogenous fertilizers ($NaNO_3$, $(NH_4)_2SO_4$, or manure) reduced the intensity of the epidemic.—(*Courtesy Biol. Abs.*)

The movement of tobacco mosaic virus within the plant, G. Samuel (*Ann. Appl. Biol., 21* (*1934*), *No. 1, pp. 90–111, pl. 1, figs. 4*).—Confirming [F. O.] Holmes, no movement of virus was demonstrated from the inoculated leaf for the first 3 or 4 days. This period is slightly less or considerably more according to the greater or less activity of growth of the plant. When the virus passes out from the inoculated leaf it travels first to the roots, with such speed that it can seldom be intercepted at intervening positions. Usually about a day later it travels with equal rapidity to the top.

"In the earliest stages of entering the stem, virus particles may be separated by considerable distances (at least several centimeters), since successive samples taken from the stem may yield lengths of 2.5 cm (the length of the cuttings) free from infection, interspersed irregularly between portions containing the infection. The presence of developing fruit trusses on the stem may cause part of the virus to travel upward as far as these trusses at the same time that the initial downward movement is occurring. The virus enters developing fruits at the same time as it travels through the stem, whereas adjacent leaves remain uninfected for days or weeks.

"In pot plants, after the initial rapid infection of the developing leaves at the top of the plant, the more mature leaves become successively invaded from the top downward and from the bottom upward until the plant is completely invaded by the virus. Complete invasion occurs very quickly in small, vigorously growing plants. It may take 3 weeks or more in medium-sized plants and as much as 2 mo. in large fruiting plants.

"Complete invasion never occurs when large field plants of tobacco or tomato bearing a number of mature leaves are inoculated. The mature leaves remain free from virus, apart from a limited movement along the midribs, for periods of more than 3 mo. following inoculation. It is considered that these facts favor the theory of a slow cell to cell movement of the virus via the plasmodesmen, combined with a rapid distribution through the plant via the phloem, and the value of tobacco mosaic virus as an indicator of phloem movements is emphasized."

Pythium damping-off and rootrot in the seed bed, P. J. ANDERSON (*Connecticut [New Haven] Sta. Bul. 359 (1934), pp. 336–354, figs. 3*).—A detailed account is presented of the effects of *P. debaryanum* in tobacco seed beds and of experiments on control. Formaldehyde-containing dust is recommended as the most practical method of prevention. Surface growth of algae is also prevented by this method.

Cellular changes in ring-spot, M. W. WOODS (*Contrib. Boyce Thompson Inst., 6 (1934), No. 1, pp. 51–67, figs. 3*).—Ring-spot lesions formed in the summer in the greenhouse on leaves of the Turkish variety of *Nicotianna tabacum* were typically much less necrotic than those formed in winter. In primary "summer" lesions there seemed to be a connection between necrotic zonation and alternating periods of light and darkness (day and night). The cytological and histological modifications that occurred in connection with the development of primary and systemic lesions were studied in living and paraffin-sectioned material. Primary lesions in *N. rustica*, *N. glutinosa*, *N. glauca*, *Petunia* sp., and *Vigna sinensis* (Blackeye variety) were also studied. The cytological and histological pictures were much the same as those in Turkish tobacco. In Blackeye cowpea, however, the vascular tissues of the leaf were much more susceptible to the virus than in the other suscepts. The environmental conditions under which the plants were grown exerted a marked effect on the development of ring-spot lesions. Lesions formed in continuous darkness in a water-saturated atmosphere were at first chlorotic, later becoming completely necrotic. In lesions formed in continuous darkness in dry air necrotic breakdown occurred more rapidly. Lesions formed in darkness were examined microscopically in living and paraffin-sectioned material.—(*Courtesy Biol. Abs.*)

Transmission of streak and mosaic diseases of tomato through seed, I, II, G. H. BERKELEY and G. O. MADDEN (*Sci., Agr., 13 (1932), No. 3, pp. 194–197, pl. 1; Fr. abs., p. 199; (1933), No. 7, pp. 455–457; Fr. abs., p. 472*).—The authors report in part 1 that healthy tomato plants were inoculated with the crushed embryos from seed taken from mosaic or streak plants. In some cases 66.6 percent positive results were obtained. Using seed from specially selected healthy plants, five crops were grown to maturity without any streak or mosaic.

Part 2 submits evidence demonstrating that mosaic is extensively transmitted through the seed. This has been proved experimentally by inoculating healthy plants with crushed embryos from mosaic plants and by growing to maturity the progeny from seed collected from mosaic plants. The effective principle may be present in seed from green as well as ripe fruit of affected plants. The seed from certain trusses of a mosaic plant may produce progeny which develop mosaic symptoms, while the seed from another truss of the same plant may produce healthy plants under similar environmental conditions, a phenomenon not yet understood. Mosaic produced by inoculating healthy plants with the crushed embryos of seed from mosaic plants is contagious and apparently similar in all respects to tomato mosaic as commonly known.

From the standpoint of prevention and control, it is concluded that growers of greenhouse tomatoes should build up their own seed supply by means of a rigid selection from, and isolation of, healthy plants.

Bacterial speck of tomatoes, M. K. BRYAN (*Phytopathology, 23 (1933), No. 11, pp. 897–904, figs. 3*).—This disease, which has been reported from Florida, Wisconsin, and Maryland, is characterized by small, dark, round, superficial spots on tomato fruit. Stems and leaves are also susceptible. Infection of seedlings was obtained from inoculated seed and from inoculated soil. The disease, formerly confused with the spot caused by *Bacterium vesicatorium*, is

due to a green fluorescent bacterium, *B. punctulans* n.sp., cultural characters of which are given as worked out in the U.S. Department of Agriculture laboratories.

The tomato root knot disease, W. NEWTON and J. E. BOSHER (*Sci. Agr., 13 (1933), No. 9, pp. 594, 595; Fr. abs., p. 608*).—A 1 percent formalin solution (0.4 percent formaldehyde) effectively controlled the root knot nematode (*Heterodera radicicola*) and appeared to stimulate the growth of the seedlings. "Lower concentrations (0.5 and 0.25 percent) were not effective in preventing infection. Calculated from the experiments, 1 gal. of commercial formalin (100 gal. of solution) will effectively sterilize 50 cu. ft. of soil. Other compounds lowered the incidence of infection but did not effectively prevent infection."

Progress in phony peach disease eradication, W. F. TURNER (*Jour. Econ. Ent., 26 (1933), No. 3, pp. 659–667, figs. 3*).—The phony peach disease is an infectious systemic disease for which no cure of the diseased tree is known. It is now known to occur in 12 Southern States and in Illinois. It is generally present and severe in Georgia and south Alabama, and during the last few years more than 1,000,000 trees have been either pulled or abandoned, and many growers have been forced out of production. Individual cases are widely scattered throughout all of the other Gulf States, but the results in these areas are not yet commercially destructive. Very few infections have been found in the remaining States, namely, Oklahoma, Arkansas, Missouri, Tennessee, South Carolina, North Carolina, and Illinois.

An eradication campaign was begun in 1929 by the U.S. Department of Agriculture in cooperation with the State of Georgia, which at that time was the only State in which the phony disease had been recognized. This work has been continued and extended to all areas now known to be infected.—(*Courtesy Biol. Abs.*)

Investigations on black knot of plums and cherries.—I, Development and discharge of spores and experiments in control, L. W. KOCH (*Sci. Agr., 13 (1933), No. 9, pp. 576–590, figs. 5; Fr. abs., p. 608*).—"Over a period of 4 yr. under natural orchard environment the initial ascospore discharge from perithecia of *Dibotryon morbosum* on *Prunus domestica*, in the Niagara Peninsula varied from March 23 to April 6, after which discharges occurred periodically until June 6 or June 7. Perithecia which were brought into the laboratory from the same trees and moistened discharged ascospores 1.5 mo. earlier than discharges were observed in the orchard. Perithecia from *P. pennsylvanica* discharged ascospores as early as November 20 in 1931 under laboratory conditions. Rainfall appeared to be the predominating factor determining the occurrence of ascospore discharge in the orchard, but on the other hand did not seem to determine its abundance. Temperatures below 40° F. appeared to reduce ascospore expulsion in the orchard and in the laboratory. In the laboratory abundant spore discharges were observed at temperatures of 50° up to 80°. Maturity of the perithecia appeared to govern the abundance of ascospore expulsions during May but did not seem to determine entirely the date of earliest spore discharges. Ascospores of *D. morbosum* proved to be wind-borne. They were found in spore traps 30 ft. from the nearest plum tree subsequent to rainfall. Conidia of *D. morbosum* were present in abundance on knots on *P. domestica* at the time ascospore discharge ceased and continued to be produced throughout the summer. Moisture and wind appeared to be the most important factors in the dissemination of conidia.

"In a block of Lombard plum trees, which were neither sprayed nor pruned, the number of knots increased 1,655 percent within a period of 3 yr. More than 96 percent control was obtained in blocks of trees subjected to a combined

program of pruning and the application of a dormant spray consisting of either 3 percent oil emulsion Bordeaux or 1:8 lime-sulfur, followed by two later sprays consisting of 1:40 lime-sulfur. The first spray, which was applied at about the time the buds were breaking, and the second spray, applied when the shucks were falling, appeared to be important in controlling the disease. Knots on large branches and trunks of Lombard plum trees were successfully removed by surgical methods."

A mosaic of the fig in California, I. J. CONDIT and W. T. HORNE (*Phytopathology, 23 (1933), No. 11, pp. 887–896, figs. 4*).—A mosaiclike trouble of fig leaves has long been recognized in California. It may almost be said that every fig tree in the State shows traces of mosaic, though the disease is not generally regarded as commercially important. The meager literature referring to it is discussed, and a description of the symptoms is given. Areas of lighter tissue occur, and leaves may be distorted. Both leaves and fruits are affected and in severe cases may drop. Studies are reported on the comparative susceptibility of varieties growing at the Citrus Experiment Station, Riverside.

Cuttings from mosaic-affected trees propagated in the greenhouse continue to show mosaic. Seedlings from affected plants have remained healthy for about a year in the greenhouse, whereas buds from healthy seedlings set in diseased trees have grown into mosaic-affected shoots. Seedlings several years in the orchard show much mosaic. The trouble under consideration is apparently a true mosaic. The natural method of transmission is unknown.

Preliminary observations and experiments on the control of olive knot [trans. title], V. PAOLETTI (*Riv. Patol. Veg., 23 (1933), No. 1–2, pp. 47–50*).—*Bacterium savastanoi* has become more serious in Italy in the last 10 yr. The most vigorous trees are not always the most seriously affected. Varieties differ as to resistance. Part of this resistance is attributed to the fact that some varieties are not so subject to minor injuries to the bark by temperature changes, winds, etc. Cuts made in the bark with a knife are soon followed by the formation of knots. Rains are also important in the spread of the disease. Two years' tests demonstrate the value of four applications of 1 to 2 percent Bordeaux mixture—(1) just after picking as a protective covering of harvesting wounds, (2) in February to protect hail injuries, (3) before the onset of spring rains, and (4) just before fall rains. Pruning should be avoided and superphosphate used instead of manure.—(*Courtesy Biol. Abs.*)

Studies on the reddening of the grapevine [trans. title], L. RAVAZ, E. DUPONT, and R. CALLAUDAUX (*Ann. Agron. [Paris], n.ser., 3 (1933), No. 2, pp. 225–231*).—It is shown that the reddish yellowing of the grape is related to a lack of K_2O in the aerial organs. In soils not specially manured the K does not penetrate into the plant in sufficient quantities, and there seems to be some obstacle to its penetration. Also, when the period of migration arrives there is an obstacle to the transfer of the leaf and stem contents into the body of the plant. This probably consists in a malfunctioning of the roots in compact, poorly aerated soils, where the reddening first appears and which K improves. Vines grown in a soil given K_2O in excess have a better developed root system than controls. Whatever may be the cause, large amounts of K_2O protect the vines from reddening for several years and improve the quality of the grapes. K also protects the plants from becoming brown.—(*Courtesy Biol. Abs.*)

Granulation (crystallization) of Valencia oranges, E. T. BARTHOLOMEW, W. B. SINCLAIR, and E. C. RABY (*Calif. Citrogr., 19 (1934), No. 4, pp. 88, 89, 106, 108, figs. 3*).—The most important factors favoring the production of granulation in Valencia oranges appear to be soil type, oil sprays, low temperature, and age and growth of the trees, especially the latter. More granulation

is usually found on young than on old trees, more on the north than on the south side of the trees, and the larger fruit is more likely to show this trouble than is the smaller fruit. No adequate practicable control has as yet been found. The term sclerocystosis is proposed for this abnormality.—(*Courtesy Biol. Abs.*)

Burn all infected corms? MRS. H. W. HALL (*Gladiolus Ann., 1933, pp. 74, 75, fig. 1*).—Gladiolus corms infected with *Bacterium marginatum* and *Penicillium* rot when thoroughly scraped, with all lesions cut out, dipped in powdered charcoal, and potted in sterilized soil with a large proportion of sand were found to flourish under this treatment. Even very mutilated specimens threw normal, healthy shoots. Early lifting of corms is recommended.

Brand canker of rose, caused by Coniothyrium wernsdorffiae Laubert, C. WESTCOTT (*[New York] Cornell Sta. Mem. 153 (1934), pp. 39, pls. 5, figs. 8*).—The results of 4 years' study of this disease, due to *C. wernsdorffiae*, are repoted. Thus far it has been observed only in Minnesota, Pennsylvania, New York, Ontario, and Quebec on this continent, but may be more wide-spread. It causes severe damage in Europe and America by girdling and killing back the flowering canes in varieties where the canes are kept covered by soil or other material during the winter as protection against freezing. For this reason climbing roses suffer chiefly. No clear difference in susceptibility has been found among 190 varieties of climbing roses at Ithaca.

The brand canker organism is distinguished from *C. fuckelii*, the cause of stem canker, by the distinctly larger average size of the spores and pycnidia in *C. wernsdorffiae* and by its lower optimum growth temperature, as well as by distinctive cultural characteristics.

Wounds serve as infection courts. Infection usually occurs in late winter or early spring while the canes are covered. Infections are few, or absent, when the canes are left uncovered through the winter. The lesions are dark in color and range up to several centimeters in length. Girdling usually results in dying back of the cane tip in May or June, but late spring girdling often fails to kill the cane. Instead it may cause gall-like tissue proliferation on the cane above the canker. The hyphae of the fungus, which are both intercellular and intracellular, invade all the tissues in the cankered area—cortex, wood, and pith—but do not extend in the vessels beyond the limits of the canker.

Infections and canker development are inhibited as the temperature rises above 70° F. The disease is brought to a standstill during the summer. Lesions develop most rapidly in the latter part of the winter.

Fungicides applied to the canes during the growing season or before covering them in the fall failed to protect against infection. Thorough removal of diseased canes proved an aid in eradication, but almost complete freedom from infection was obtained by leaving the canes uncovered during the winter, a practice which appeared to make little difference in the way the majority of varieties came through the winter.

Death of elms produced by Graphium ulmi [trans. title], E. CORNELI (*Riv. Patol. Veg., 23 (1933), No. 1–2, pp. 27–31, pls. 2*).—In 1930 the elm disease caused by *G. ulmi* was first found in Umbria near Foligno and S. Sisto. In 1931 it was found also near Pila, Bosco, and Ponte Felcino. In cultures, synnemata developed on peeled elm twigs and on elm leaf decoction agar measured from 300 to 400 μ in height and from 25 to 30 μ in width, having terminal caps of a maximum diameter of about 120 μ. The spores were nonseptate, hyalin, round or slightly elongated, and 2.5–3 by 2–3 μ. On carrot and beef extract agars bacteriumlike colonies were formed by multiple bud-

ding. Around the margins of such colonies conidiophores bearing spores 7–8 by 3–3.5 μ referable to *Cephalosporium* were formed. Wound infection experiments with each of the three kinds of spores (*Graphium*, *Cephalosporium*, and budding spores) gave positive results. Early removal of affected branches was sometimes successful.—(*Courtesy Biol. Abs.*)

Leaf scorch of shade trees (*New Jersey Stas. Circ. 310 (1934), pp. 2*).—Scorching of foliage due to excess of transpiration over available moisture supply in hot weather is explained, and preventive practices are outlined.

[Diseases of shade trees] (*New Jersey Stas. Circs. 307–309 (1934), pp. 2 each*).—These circulars deal respectively with Anthracnose Disease of Shade Trees, Elm Diseases, and Leaf Blotch of Horse Chestnut. Nontechnical descriptions are followed by suggestions for control.

Diseases threatening ornamental and forest trees, R. K. Beattie (*Jour. Econ. Ent., 26 (1933), No. 3, pp. 621–624*).—A discussion is given of the present status of the Dutch elm disease, caused by *Graphium ulmi* in Ohio; European larch canker, caused by *Dasyscypha willkommii* in Massachusetts; Woodgate rust of Scotch pines, caused by a *Peridermium* in New York; resinosis of white and red pine in New York; and of fir needle blight, caused by *Rehmiellopsis bohemica* in New England.—(*Courtesy Biol. Abs.*)

The course of mycelia of Gymnosporangia in the trunks of cedars, B. O. Dodge (*Natl. Shade Tree Conf. Proc., 9 (1933), pp. 94–101*).—A general discussion of host-parasite relations among the *Gymnosporangia* attacking cedars and junipers, studied by the author in the vicinity of New York City, is followed by a more detailed description of such relations in trunk tissues for *G. germinale* (*G. clavipes*), *G. nidus-avis*, *G. juniperi-virginianae*, *G. globosum*, *G. trachysorum*, *G. clavariaeforme*, *G. botryapites*, and *G. myricatum*. The diverse localization of the mycelium, the appearance of the haustoria, the time required for the development of the fungus, and the effect on and the response of the host are touched on.

Experiments in combating damping-off [trans. title], V. Landucci (*Alpe [Firenze], 19 (1932), No. 10, pp. 359–367, figs. 9*).—On the basis of experiments with *Cedrus atlantica* and *C. deodara* the author advises the addition of powdered aluminum sulfate to the sand required to cover the seed, using it at the rate of 50 g per square meter, and repeating if necessary under warm, humid conditions with 10- to 40-g dosages at 10- to 15-day intervals. This method resulted in an average reduction of damping-off from 40 to 23 percent with *C. Atlantica* and from 26 to 16 percent with *C. deodara*.

Meria laricis, the leaf cast disease of larch, T. R. Peace and C. H. Holmes (*Oxford Forestry Mem. 15 (1933), pp. 29, pls. 5*).—This fungus, which appears to be one of the most important fungus diseases of European larch in nurseries in Great Britain, causes browning and shedding of the needles. The optimum temperature for its growth is about 17.5° C. The spores are very sensitive to dry conditions. *Larix occidentalis* is occasionally attacked, but Japanese, Siberian, and Korean larches are extremely resistant. The disease is greatly influenced by moisture, and dry weather often causes almost a complete cessation of attack. It cannot spread far without biotic aid. New nurseries can be kept free from the disease by introducing larch only as seed. Damage is serious only in the nursery. It can be serious in 1-year beds, but is generally worse on plants which are spending the second year in the same bed or transplant line. Frost has been suggested as a predisposing factor, but *Meria* can become epidemic without frost damage. The disease can be kept in check by sulfur sprays.—(*Courtesy Biol. Abs.*)

Leaf cast of larch (Meria laricis Vuill.) (*[Gt. Brit.] Forestry Comn. Leaflet 21 (1933), pp. 5, figs. 3*).—A popular description and control recommendations are given.

Spore germination tests of Oidium quercinum [trans. title], G. Tini (*Riv. Patol. Veg., 23 (1933), No. 1–2, pp. 43–45*).—Unsuccessful attempts were made to germinate the ascospores from leaves of *Quercus sessiliflora* from Mount Subasio near Assisi by various described methods. Conidia germinated best at 18° to 20° [C.], at 25° only 50 percent germinated, and at 30° none. Conidia in hanging drops and on leaves were subjected to low temperatures and then given a favorable temperature. About 50 percent of those subjected to 10° on the leaves for 24 hr. germinated, while those subjected to the same conditions in hanging drops did not germinate. It is concluded that in Italy the conidial stage may overwinter on the host.—(*Courtesy Biol. Abs.*)

The protection of forest nurseries from white-pine blister-rust infection, S. B. Fracker and R. A. Sheals (*Jour. Econ. Ent., 26 (1933), No. 3, pp. 641–648*).—White pine nursery stock can be, and in many cases is being, protected from blister rust by a *Ribes*-free zone around the premises. Consistent intensive effort is required, and the costs range from less than $100 to $1,000 or more for a single nursery. An annual follow-up is necessary. Only 5-leaved pines so protected are allowed to be shipped out of infected States, except where the shipment is consigned to a point in one of the several Northeastern generally infected States.

All white pine nursery stock should be produced under protected conditions, *not only to avoid the danger of introducing the blister rust into uninfected* localities, but to avoid loss and disappointment on the part of the purchaser.—(*Courtesy Biol. Abs.*)

Insect transmission of spike disease, M. Sreenivasaya (*Nature [London], 133 (1934), No. 3358, p. 382*).—Grafting tests indicate that plants of sandal showing symptoms similar to those produced by the spike disease, after the feeding of the jassid (*Moonia albimaculata*), did not carry the virus of the disease. This confirms the suspicion of the author that this insect has not been proved a vector.

ECONOMIC ZOOLOGY—ENTOMOLOGY

An index to the international rules of zoological nomenclature, compiled by H. J. Van Cleave (*Amer. Micros. Soc. Trans., 52 (1933), No. 4, pp. 322–325*).—This is an index to the numbered articles in the 1926 edition of the International Rules of Zoological Nomenclature.

Birds of West Virginia: A check-list, P. C. Bibbee (*West Virginia Sta. Bul. 258 (1934), pp. 47*).—This account has been prepared to give, as nearly complete as possible, a check list of all the birds occurring or known to have occurred in West Virginia. A brief account is given of each species, indicating whether it is rare or common, and, if common, whether generally or locally distributed. A list of 23 references to the literature is included.

[Notes on economic insects and insecticides] (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 382–388, 410–420, 481, 547–549, figs. 3*).—The contributions presented (E.S.R., 71, p. 66) are as follows: The Effect of Petroleum Oil Fly Sprays on Dairy Cattle, by S. B. Freeborn, W. M. Regan, and L. J. Berry (pp. 382–388), continuing earlier work in California (E.S.R., 67, p. 576); Arsenic Deposit and Codling Moth Control, by R. L. Webster (pp. 410–417), reporting work at the Washington Experiment Station; Effects on Apple Foliage of Different Arsenicals and Fungicides in Combination, by C. R. Cutright (pp. 417–420), reporting on observations in Ohio; Japanese scale, *Leucaspis japonica* Ckll., by E. P.

Felt (p. 481); *Myelois venipars* Attacking Apples in Oklahoma, by E. Hixson (p. 547); Host Plants of the Potato Psyllid [*Paratrioza cockerelli*], by G. F. Knowlton and W. L. Thomas (p. 547); Wheat Bunt [*Tilletia levis*], a New Food for Grasshoppers [*Melanoplus mexicanus mexicanus* Sauss. and *M. packardii* Scudd.] by P. A. Young (p. 548); and Green Peach Aphid Injuring Snapdragon, by G. A. Thompson, Jr. (p. 549).

[Report of work in entomology in Ohio] (*Ohio Sta. Bul. 532 (1934), pp. 39–46, figs. 2*).—The work of the year here dealt with (E.S.R., 69, p. 72) includes that with the potato flea beetle, by H. L. Gui; greenhouse insects, including the common red spider, the cyclamen mite, and the Mexican mealy bug (*Phenacoccus gossypii* T. & Ckl.), by C. R. Neiswander; the gladiolus thrips, by [E. A.] Herr; onion maggot and onion thrips, both by J. P. Sleesman; oriental fruit moth, by R. B. Neiswander; chinch bug, by L. L. Huber and J. S. Houser; corn ear worm and European corn borer, both by Huber, [J. B.] Polivka, and [J. R.] Savage; codling moth and rosy apple aphid, both by C. R. Cutright; and a State forest insect survey, by Houser.

Microscopic observations on blood coagulation in several different species of insects, J. F. Yeager and H. H. Knight (*Ann. Ent. Soc. Amer., 26 (1933), No. 4, pp. 591–602*).—In the course of the studies here reported, microscopic observations were made upon the bloods of 47 different species of insects and the coagulation process noted.

Tobacco insects in 1933, D. S. Lacroix (*Connecticut [New Haven] Sta. Bul. 359 (1934), pp. 377–382, fig. 1*).—An account first given of the occurrence of various species of tobacco insects in Connecticut in 1933 (E.S.R., 69, p. 550) is followed by particular mention of the tobacco thrips, potato flea beetle control, wireworm control, and the distribution of wireworm larvae in tobacco soil, the details of which last are reported in tabular form.

Some comparisons between calcium arsenate and lead arsenate as general insecticides for apple, P. J. Chapman, G. W. Pearce, R. W. Dean, and O. H. Hammer (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 421–431, figs. 3*).—In comparisons made at the New York State Experiment Station, "calcium arsenate and lead arsenate used on an equal weight basis were about equally efficient against plum curculio, rose leaf beetle, rose chafer, and apple maggot. Lead arsenate gave better control of codling moth and the green fruit worms. Commercial calcium arsenates vary in safeness. A correlation was found among the brands between the degree of foliage injury, amount of carbonation, and rate of arsenic weathering from spray deposits. No entirely safe brand was found. Foliage injury records were based principally on the occurrence of yellow leaves; the degree of injury was measured by means of an arbitrary scale of values ranging from 1 to 10. Hydrated lime added to calcium arsenate sprays tends to suppress arsenical injury, but may simply postpone it. Aluminum sulfate proved superior to hydrated lime or iron (ferrous) sulfate as an injury-corrective when added to calcium arsenate and liquid lime-sulfur. Calcium arsenate is less adhesive than lead arsenate. Likewise, the rate of arsenic loss is influenced considerably by the fungicide or injury-corrective present.

"McIntosh proved much less sensitive to injury to all insecticide-fungicide combinations than Baldwin, Rhode Island Greening, and Ben Davis. To eliminate growth and, to a certain extent, variation in fruit size from studies on the weathering of spray residues, data are expressed on the basis of milligrams per fruit."

Notes on summer oil emulsions, S. W. Frost (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 459–461*).—This is a contribution from the Pennsylvania Experiment

Station in which the details are presented in tabular form. The investigations in 1933 here reported, together with those of the preceding year (E.S.R., 69, p. 236), indicate that "2 percent summer oil emulsions can be used safely on apple but not in combination with fungicides. If used with lime-sulfur or wettable sulfurs, serious burning results, especially when applied during the late summer. The finer the sulfur, the more serious is the burning. When used in combination with Bordeaux, a residue is left which cannot be removed. It even produces a permanent discoloration of the fruit. Certain commercial summer oil emulsions can be used safely at 2 percent dilution on peach. Wettable sulfurs and basic arsenate of lead may also be added to summer oil emulsions without causing injury. The value of this combination for oriental fruit moth is, however, negligible unless applications are made at weekly intervals."

Tentative standard concentration of tar distillates for certain insects, F. Z. HARTZELL and G. W. PEARCE (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 453–459, figs. 2*).—This is a contribution from the New York State Experiment Station in which the authors deal with the action of ingredients, concentrations for certain insects, and aids for determining correct dilutions of emulsions.

Some field tests showing the comparative efficiency of derris, pyrethrum, and hellebore powders on different insects, C. C. HAMILTON and L. G. GEMMELL (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 446–453*).—Laboratory and field tests at the New Jersey Experiment Stations with powders containing derris, pyrethrum, or hellebore are reported. It was found in laboratory tests with certain plant lice, such as the spirea aphid (*Aphis spiraecola*) and the cabbage aphid, and in field tests with the Norway maple aphid, that applied as dust pyrethrum powder gave a quick and good kill, derris powder a fair kill, and hellebore very little kill. When these dusts were diluted in water, the derris powder gave the best kill, pyrethrum powder gave a satisfactory kill but not as good as the derris powder, and hellebore again gave an unsatisfactory kill.

"On the grape leaf hopper derris powder and pyrethrum powder, or mixtures of the two powders, gave satisfactory control. Applications with the power duster show that dusts containing derris powder equivalent to 0.5 percent rotenone was as effective as those dusts containing 1 percent rotenone. Also that a pyrethrum powder (containing 0.73 percent pyrethrins used 1 part to 4 parts of clay gave good control of the leaf hoppers. There were some indications that the pyrethrum powder acted quicker on the grape leaf hopper than did the derris powder, but that the derris powder retained its toxicity for a longer time. Hellebore was ineffective against the grape leaf hopper. Heavy applications of a dust containing 1.5 percent nicotine knocked down the grape leaf hoppers, but did not kill them. Cultivation with a disk cultivator before the leaf hoppers recovered gave a satisfactory kill with the nicotine dust.

"Tests on the elm leaf beetle gave good control with derris powder, pyrethrum powder, or mixtures of these two, when applied at the rate of 1 lb. in 3 gal. of water. The derris treated trees retained considerable toxicity for 6 days, the pyrethrum treated trees some toxicity, and the hellebore treated trees had lost most of their toxicity at the end of 3 days.

"Tests on the cabbage worm showed the possibility of good control with derris, pyrethrum, or hellebore dust. The derris dusts were the best, hellebore next best, and pyrethrum the poorest. The tests further show that diluting the derris powder or pyrethrum powder, or mixture of the two, in water and applying as sprays gave good control against plant lice and elm leaf beetles."

Notes on the use of derris and pyrethrum dusts for the control of certain insects attacking cruciferous crops, H. G. Walker and L. D. Anderson (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 388–393*).—This is a contribution from the Virginia Truck Experiment Station reporting upon the comparative insecticidal value of various pyrethrum and derris dusts, derris having been used in combination with different carriers, against the cabbage looper, the diamondback moth, and the harlequin bug. The details of the work are presented in tabular form.

Insecticidal properties of completely extracted derris root residue, J. M. Ginsburg (*Jour. Econ. Ent., 27 (1934), No. 2, p. 393*).—This is an abstract of a contribution from the New Jersey Experiment Stations reporting upon toxicity tests with derris root powder and its exhausted residues, after extraction with acetone and with acetone followed by water, carried out against chewing and sucking insects.

The results have led to the conclusion that "derris root dust is very toxic to sucking and chewing insects. Against aphids the toxicity was greater when the dust was applied on wet foliage than on dry foliage. Residues from derris root completely extracted with acetone possess practically no toxicity to aphids, but are both toxic and repellent to caterpillars. Residue from derris root extracted first with acetone and then with water does not seem to possess direct toxicity to caterpillars but acts as a deterrent, preventing them from feeding on the dusted foliage."

Toxicity of various extracts of derris root to sucking and chewing insects, J. M. Ginsburg, J. B. Schmitt, and P. Granett (*Jour. Econ. Ent., 27 (1934), No. 2, p. 446*).—This is an abstract of a paper contributed from the New Jersey Experiment Stations, from which it is concluded that "water-soluble organic solvents such as acetone and alcohol are able to extract practically all of the water-soluble and water-insoluble ingredients of derris root toxic to sucking insects. Either continuous distillation or soaking with subsequent filtration and washing will extract practically all the active principles when acetone or alcohol is used. Water does not extract all the toxic principles of derris root. At low dilutions the water extracts compared well in toxicity with acetone and alcohol extracts, but proved inferior to them in high dilutions. Water extracts rapidly deteriorate on standing with resultant loss of toxicity."

Sulphur fumigation of mushroom houses, A. C. Davis and H. D. Young (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 518–525, fig. 1*).—The authors here report upon experiments with sulfur, including a comparison of the two grades of sulfur used in fumigation, preparation of the house for fumigation, distribution of gas in the house, and the effect of sulfur fumigation upon pests.

Halowax as a contact insecticide, E. P. Breakey (*Jour. Econ Ent., 27 (1934), No. 2, pp. 393–398, fig. 1*).—In this contribution the author reports upon a synthetic product, the insecticidal properties of which are said to have been demonstrated.

Some effects of ethylene oxide on the various stages of the bean weevil and the confused flour beetle, W. R. Horsfall (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 405–409*).—In experiments conducted by the author ethylene oxide was found to have the following effects upon the various stages of the bean weevil and the confused flour beetle: "A disturbance of the normal development of the histoblasts that determine the adult appendages was produced when prepupae were treated. Pupae were found to be injured less than the prepupae. A treatment of adults caused a decrease in oviposition, a delay of the oviposition, and more inactivity on the part of the females as the length of exposure

increased. Unfertilized females were killed or prevented from ovipositing by an exposure that had no effect on the males."

The relationship of fineness of sulfur particles to effectiveness against the citrus thrips in central California, E. A. McGregor (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 543–546, figs. 2*).—Orchard experiments led the author to conclude that there is a well-pronounced correlation between the fineness of sulfur particles and the resulting effectiveness against the orange thrips.

Studies on control of the white apple leafhopper in Connecticut, P. Garman (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 361–364, fig. 1*).—In preliminary work with the white apple leaf hopper at the Connecticut [New Haven] Experiment Station nymphs were found to be easy to kill by a number of sprays, including pyrethrum products, nicotine sulfate, free nicotine, and anabasine sulfate. For late season sprays, pyrethrum soaps and similar preparations appear to be equally as effective as nicotine sulfate, the only consideration being relative cost per gallon of spray. Besides nicotine sulfate, both anabasine sulfate and free nicotine have given satisfactory kills in a dilution of 1:800 without the addition of soap or activator.

Control of the blossom-blight of the mango, F. B. Serrano and M. A. Palo (*Philippine Bur. Sci. Pop. Bul. 17 (1932), pp. 18, pls. 8*).—A more detailed account of this leafhopper affection of mango has been noted from another source (E.S.R., 69, p. 387).

The relative value of Bordeaux mixture, sulphur, and pyrethrum products in reducing populations of the potato leafhopper (Empoasca fabae Harris), D. M. DeLong (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 525–533, figs. 12*).—Bordeaux mixture was found to be effective in reducing potato leaf hopper population "by producing a plant condition that might be termed a residual effect, so that the hatching leaf hoppers die over a period of several days after application. Under specific conditions, however, Bordeaux may cause injury to bean plants.

"Of the contact insecticides, pyrethrum is the only one which has given any promise, and this one is of value only in reducing immediate populations. It is highly toxic to leaf hoppers but has no residual value, so populations of hatching nymphs build up very rapidly in case of spray or dust applications.

"As a substitute spray flotation sulfur paste 8 to 50, wettable dry sulfur 5 to 50, and dry mix spray 12.5 to 50 have given excellent results. Sulfurs show a residual effect similar to Bordeaux mixture.

"In areas where dusting is most practical or dusts are desired, dusting sulfur, 300-in. mesh, combined with 5 to 10 percent of pyrethrum dust has given excellent results. The pyrethrum dust in small quantity gives a toxic value for immediate reduction, and the sulfur gives a residual value which prevents the rebuilding of the population when reduced. This is probably the safest and most economical form in which sulfur can be used.

"Sulfur products have the further value of being important in controlling other pests on bean. Red spider has been controlled effectively, and there is indication that they may be of at least some value in protecting plants against [the Mexican] bean beetle. Bordeaux mixture is of practically no value against either of these pests."

Observations on the habits and control of Glossonotus crataegi (Membracidae) on plum and apples, R. Hutson (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 365–367*).—Preliminary observations on the life history and habits of *G. crataegi* at the Michigan Experiment Station show the insect to overwinter in the egg stage, that its eggs are inserted in the bark of the host plant through a single opening, and that it is primarily a one-host form. It is quite

apparent that the dormant oil sprays do not constitute a sufficient control measure against this pest. The nymphal stages are very susceptible to contact sprays, a spray consisting of 1 gal. of summer oil emulsion plus 0.5 pt. of nicotine sulfate in 100 gal. of spray having given complete control, as did also a spray consisting of 0.5 pt. of nicotine sulfate plus 0.5 gal. of Penetrol in 100 gal. of spray.

Vegetable plant lice, R. C. Burdette and T. J. Headlee (*New Jersey Stas. Circ. 311 (1934), pp. 31, figs. 20*).—This practical account supersedes Circular 178, previously noted (E.S.R., 54, p. 554).

The role of some southern pine products in the control of Aphis rumicis Linn., C. O. Eddy (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 398–400*).—This contribution from the Kentucky Experiment Station reports upon work confined to pine tar and pine tar oil in water-soluble form as they assist soap or soap-nicotine solutions in bean aphid control.

The woolly apple aphid in Tennessee, S. Marcovitch (*Tennessee Sta. Bul. 151 (1934), pp. 16, figs. 16*).—A practical summary of information on the woolly apple aphid based upon observations in Tennessee, where it is an important pest of the apple, especially on nursery stock. Tests were made in 1929, on 2-year-old trees, of paradichlorobenzene, paranitrochlorbenzene, nicotine, pine-tar creosote, and carbon disulfide emulsion, of which the last appears to be the most promising and practical in the newly set orchard.

Root infestation seems to take place by the migration of the aerial forms through cracks in the soil. Trees grown in sandy soils, which do not crack, are comparatively free from root trouble. Mulching with 3 in. of sand also effectively reduced the number of woolly apple aphids on the roots and should be a practical measure for the newly set orchard.

A list of 19 references to the literature is included.

Some observations on the balsam woolly aphid in Maine, H. B. Peirson and A. M. Gillespie (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 340, 341*).—Notes are presented on *Adelges piceae*, which has become very destructive to balsam fir in Maine.

Notes on the beech scale, Cryptococcus fagi (Baer.) Dougl., in New England, R. C. Brown (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 327–334, figs. 3*).—Notes are presented on the life history and natural enemies of the beech scale and on the results of a survey of conditions in southeastern Maine. It was found in the survey that (1) the fungus (*Nectria* sp.) which attacks the American beech, although apparently definitely associated with the scale, has not yet reached epidemic proportions, (2) slime fluxes are distinctly more abundant on trees infested with the scale, and (3) the general health of trees infested by the scale is impaired to a much greater degree than that of uninfested trees. A recent account of this insect and its relation to the beech disease has been noted (E.S.R., 70, p. 362).

Field tests on Long Island of derris as an insecticide for the control of cabbage worms, H. C. Huckett (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 440–445*).—In work at Riverhead, N.Y., derris dusts gave satisfactory results in the field for the control of cabbage worms (the imported cabbage worm, diamondback moth, and cabbage looper). "A derris-clay dust of 0.5 percent rotenone content applied four times at about 15-day intervals during a 10-week period of infestation gave as satisfactory results as five or seven applications at shorter intervals. A derris-clay dust of 0.5 percent rotenone strength gave as satisfactory results as dusts of 1 percent rotenone strength. A dust of 0.33 percent rotenone strength was not as effective. Talc, clay, and tobacco dust gave promise of being satisfactory diluents for derris dusts. Hydrated lime apparently affected adversely the toxicity of derris dusts.

"Rotenone sprays did not give as high degree of control as dusts, possibly due to the apparently greater infestation in the sprayed section as indicated by the untreated plants. A rotenone spray of 1:10,000 dilution was as effective as sprays of 1:5,000 dilution. There was very little difference in the comparative merits of the various spreaders used with rotenone when applied as freshly mixed sprays; equally satisfactory results were obtained from all sprays."

Exploring the upper air for wind-borne gipsy moth larvae, C. W. Collins and W. L. Baker (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 320–327, figs. 3*).—The authors report that only four first-instar gypsy moth larvae were taken during the two seasons of flight—one at an altitude between 300 and 500 ft. and two at 1,000 ft. in 1932 and one at 2,000 ft. in 1933.

Bentonite compounds as agents for the retention of nicotine on apple foliage and fruit in codling moth control, B. F. Driggers and B. B. Pepper (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 432–440*).—Work conducted at the New Jersey Experiment Stations here reported has led to the conclusion that "(1) bentonite sulfur 'fixes' and/or 'sticks' the nicotine of nicotine tannate and nicotine sulfate to the foliage of apple more firmly than when these two nicotine compounds are used alone, [and] (2) by retaining the nicotine in larger amounts and over a longer period of time, bentonite sulfur when used with relatively unstable nicotine compounds prolongs the toxicity of these compounds to codling moth larvae and, therefore, increases the efficiency of these compounds when used as a control for codling moth."

Notes on codling moth control in 1933, E. N. Cory (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 509–514*).—This is a contribution on control work with the codling moth conducted in 1933 in Maryland, where the situation varied from very bad on the Eastern Shore to normal conditions in western Maryland. The details are presented in tabular form.

A second report on codling moth bands in Pennsylvania, H. N. Worthley (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 346–352*).—This second contribution from the Pennsylvania Experiment Station (E.S.R., 68, p. 642) reports upon the toxicity and attractiveness of bands and band catch v. total population, the details being presented in part in tabular form.

Codling moth situation in Virginia, W. J. Schoene (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 505–508*).—In this contribution from the Virginia Experiment Station the author reports upon the events preceding the outbreak and the extensive occurrence of the codling moth in Virginia orchards in 1933. It is believed that the outbreak is traceable in part to the favorable weather and to the abbreviated spray schedule, and that the abundance of worms in most orchards dated from the summer of 1932.

The codling moth problem in Missouri, L. Haseman (*Missouri Sta. Bul. 334 (1934), pp. 16, figs. 4*).—This is a practical summary of the findings and results of experimental control work with the codling moth conducted during the past 20 years by the station department of entomology. The subject is presented under the headings of life history, spray control, spraying experiments and what they indicate, timing the sprays, and supplementary controls.

Phototropic responses of the codling moth, P. J. Parrott and D. L. Collins (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 370–379, figs. 6*).—In work at the New York State Experiment Station it was found that codling moth activity, as indicated by light trap and bait pail catches, was strongly influenced by temperature, a temperature below 60° F. generally inhibiting flight. "Other adverse weather conditions affected the bait pails to a greater degree than the light traps, since high winds caused loss of material from the pails and

heavy rains caused dilution and overflow, while the extremely hot weather of the past season caused too rapid evaporation, and other conditions induced souring of the bait. The relative positions in the seasonal distribution of high points in trap catches, and high points in emergence as judged by emergence cage records, indicate that emergence in the orchard begins earlier and proceeds to a climax sooner than emergence in the cages under the conditions described.

"Data from liberations of known numbers of moths from emergence cages show that on cool nights the trap catches do not maintain their normal relationship to the daily emergence. The capture at night in light traps of marked virgin females liberated on the afternoon of the same day indicates that females are attracted and killed before oviposition. Seventy percent of the bait pail captures and 43 percent of the light trap captures were females, but the average catch per trap of both sexes together was so much higher in the light traps that the actual number of females captured per tree was about the same in both bait pails and light traps. In trees which had both bait pails and light traps the light traps captured nearly twice as many females as the bait pails.

"The light trap catches indicated a fairly even distribution of the codling moth population throughout the lighted area, with a tendency to smaller catches in smaller trees and slightly larger catches in certain border trees."

Paradichlorobenzene, naphthalene, and the cedar oils inefficient as repellents against clothes moth adult, S. C. BILLINGS, JR. (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 401–405, figs. 4*).—Brief reference is made to the comparative value of numerous proprietary preparations containing one or more of these three ingredients, all having proved equally ineffective when used as repellents against the adult webbing clothes moth.

Heat production and limitation of densities in Sitotroga populations, S. E. FLANDERS (*Ann. Ent. Soc. Amer., 26 (1933), No. 4, pp. 529–535*).—In work by the California Citrus Experiment Station the two population phenomena of density limitation and heat production dealt with were found to be mechanical in nature. "In equal environments the number of survivors per unit of high initial populations varied inversely with the initial population as a direct result of internecine activity. The amount of energy transformed by the developing larvae into heat increased until the larvae ceased feeding. This heat can be used as a measure of the relative abundance of larvae. The number of larvae of the same age living at the same time in a given amount of corn rarely, if ever, exceeds in number 50 percent of the kernels.

"It appears possible that these phenomena are common to all insect populations which subsist upon the media in which they live."

A list is given of 17 references to the literature.

Spray experiments for the control of the European pine shoot moth, R. B. FRIEND and A. S. WEST, JR. (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 334–336*).—In experimental control work with the European pine shoot moth, conducted by the Connecticut [New Haven] Experiment Station and the Yale University School of Forestry, lead arsenate-fish oil appears to have given the most practical results, although its use on ornamental trees might be objectionable due to the coating of arsenate which remains for a considerable time. It is suggested that either the second or third application might be omitted without detracting from the control effected. Single applications of the lead arsenate-fish oil mixture as well as of the nicotine sulfate 0.5 percent Penetrol-lead arsenate spray on July 3 proved wholly ineffective. Likewise, three appli-

cations of calcium arsenate dust applied to trees 20 ft. high from a truck failed to give appreciable results.

A control for the raspberry crown borer, J. H. Clark (*New Jersey Stas. Circ. 304 (1934), pp. 4*).—This practical account reports that work in New Jersey has shown eggs of the raspberry root borer to be killed on the red raspberry by an application of an emulsion of a highly refined white oil. The emulsion used in the experiments contained 83 percent actual oil, used at a dilution of 1 part to 150 parts of water. Because of the difficulty of hitting all the eggs, sprays were not successful on the Evergreen blackberry and so are recommended only for the red raspberry.

Cranberry girdler, C. S. Beckwith (*New Jersey Stas. Circ. 314 (1934), pp. 4*).—A brief practical account of the most destructive insect that attacks cranberry vines in New Jersey.

Cranberry blossom worm, C. S. Beckwith (*New Jersey Stas. Circ. 312 (1934), pp. 4*).—A brief practical account of a serious pest (*Epiglaea apiata* Grote) on New Jersey cranberry bogs.

The apple leaf-curling midge, a new pest of apples, W. D. Whitcomb (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 355–361, fig. 1*).—This contribution from the Massachusetts Experiment Station reports upon the distribution, anatomy, related species, host plants, injury, life history, seasonal history and number of generations, natural enemies, and control measures for *Dasyneura mali* Kieff., observed by the author for the first time in the United States in 1928 infesting apple trees at Ipswich, Mass. In 1932 the pest increased considerably in the originally infested orchard and was found in several other properties in that town, and in 1933 it was taken in 15 towns comprising an estimated area of about 1,000 sq. miles in northeastern Massachusetts and southeastern New Hampshire. The infested territory is said to include some of the largest commercial orchards in New England. Its injury is confined to the foliage on terminal branches and water sprouts, the rolled leaves ceasing to function properly and falling prematurely so that the growth is slightly delayed and stunted.

The embryology of the black fly Simulium pictipes Hagen, Mrs. F. L. Gambrell (*Ann. Ent. Soc. Amer., 26 (1933), No. 4, pp. 641–671, figs. 45*).—This report of studies is presented in connection with a list of 49 references to the literature.

Notes on the life history and biology of Centeter unicolor Aldrich, L. B. Parker (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 486–491, fig. 1*).—This is a report of a preliminary study of the life history of the dipteran *C. unicolor*, which first came to the author's attention as a parasite of *Anomala sieversi* Heyd. and *Phyllopertha pubicollis* Waterh. in the spring of 1931 while he was engaged in the collection of *Tiphia vernalis* Roh. at Suigen, Chosen (Korea), for shipment to the United States. The study was continued in the spring of 1932.

Some observations on long distance dispersal of apple maggot flies, A. I. Bourne, W. H. Thies, and F. R. Shaw (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 352–355, figs. 2*).—In work conducted by the Massachusetts Experiment Station in which approximately 1,000 specimens of marked flies were liberated on July 21 in a small apple tree transplanted for that purpose in a section of the State Forest Nursery, 143 flies were collected during the following 22 days. In the first few days following liberation of the flies marked specimens were collected in the immediate vicinity of the point of release, having been found on ornamental shrubs at a distance of approximately 60 yd. A marked fly was collected August 5 on a young Wealthy tree 728 yd. from the point of release, and later, another specimen at 568 yd. distance.

Seed treatments for control of root maggots, H. Glasgow (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 303–308, figs. 2*).—This contribution from the New York State Experiment Station reports tests made on various cruciferous crops and several of those subject to attack by the onion maggot and the seed-corn maggot, calomel being used as the insecticide. Thus far, the seed treatment with calomel or with other mercurials has proved of little or no value when applied to such rapidly growing crops as radishes or turnips; neither does it appear to have any appreciable effect in reducing injury by the seed-corn maggot.

Tests have repeatedly shown that when the regular rate of seeding for onions is carried out the practice of treating the seed with calomel will not insure satisfactory control of the maggot, the concentration of the insecticide not being sufficiently great. Although the amount of injury in such cases may be very noticeably reduced, the results are seldom sufficiently consistent in the face of a severe outbreak to warrant its application. In special cases, however, where a much heavier rate of seeding is the rule, as in the production of set or bunch onions, the seed treatment appears to have a place and has found favor particularly among the growers of bunch onions in some localities, even though the cost may be materially greater than that of other equally effective methods of control.

The known distribution of the Japanese beetle in 1932 and 1933, H. Fox (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 461–473, figs. 3*).—This is an account of the further distribution of the Japanese beetle (E.S.R., 67, p. 577). A map showing the regional concentration of the Japanese beetle in the area of continuous infestation of 1933 is included.

A preliminary report on the horizontal movement of grubs of the Japanese beetle, I. M. Hawley (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 503–505*).—The author has found that under greenhouse conditions grubs of the Japanese beetle move horizontal distances as great as 7 ft., or as far as the bins used in the tests would permit.

The effectiveness of paradichlorobenzene and naphthalene in preventing oviposition by the Japanese beetle, J. W. Lipp (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 500–502*).—In tests conducted with anthracene and naphthalene during July 1933, it was found that the former had little value in preventing oviposition by the Japanese beetle but that naphthalene gave very good results.

In outdoor tests paradichlorobenzene and naphthalene, applied to the surface of 4-in. pots and covered with 0.5 in. of soil, were compared. Placed in cages with the beetle, no eggs were found in any of the pots to which paradichlorobenzene was applied. In practically all these pots, however, dead beetles were found, varying in number up to 54 per pot, although in no case was a beetle found below the layer of crystals. Although napthalene was not entirely effective in preventing oviposition, considerably fewer eggs were laid in the treated than in the untreated pots, the average being 1.7 per pot in the former and 43.5 per pot in the latter.

The application of 1 oz. of paradichlorobenzene to the surface of a 10-in. pot, nearly filled with soil and covered with a 0.5-in. layer of soil, prevented oviposition for 18 days. The pot subjected to oviposition on the eighteenth day after treatment and examined on the twenty-fifth day contained 67 eggs, while the untreated pot contained 42 eggs. Pots with 2 oz. of paradichlorobenzene were subjected to infestation on the eleventh, eighteenth, twenty-first, and twenty-fifth days after treatment and examined, respectively, on the eight-

eenth, twenty-fifth, twenty-eighth, and thirty-second days after treatment. No eggs were found in any of the treated pots, while the untreated pots contained from 87 to 143 eggs.

"When 1 oz. of napthalene was used, 15 eggs were found in the pot subjected to infestation on the eleventh and examined on the eighteenth day after treatment, whereas the untreated pot contained 85 eggs. The treated pot subjected to infestation on the eighteenth day contained 9 eggs, while the untreated pot contained 91. With a 2-oz. dosage of naphthalene similar results were obtained as with 1 oz. up to 18 days, but a pot subjected to oviposition 21 days after treatment contained no eggs when examined 1 week later, while the untreated pot contained 117 eggs. In two tests with pots subjected to infestation 25 days after treatment, one treated pot contained 1 egg while the untreated pot in the same cage contained 186 eggs, and in the other cage the treated pot contained no eggs while the untreated pot contained 112 eggs."

Small mammals as predators on Japanese beetle grubs, R. J. SIM (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 482–485*).—The author has found that Japanese beetle larvae and similar forms serve as food for the majority of small terrestrial mammals. Of these, the common mole, the large short-tailed shrew, the skunk, and perhaps the pine mouse are the most important.

An improved Japanese beetle trap, F. W. METZGER (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 473–476, figs. 2*).—Illustrated descriptions are given of traps developed during the summer of 1933, one of which appears to possess advantages over those previously devised.

The Asiatic garden beetle as a pest in vegetable gardens, H. C. HALLOCK (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 476–481, figs. 6*).—An account of *Autoserica castanea* Arr., which for the first time in the summer of 1933 caused extensive destruction in the vegetable gardens on Long Island.

Experimental studies on the wheat wireworm (Agriotes mancus Say), W. A. RAWLINS (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 308–314*).—The experimental studies here reported indicate that the most satisfactory means for wheat wireworm control consists in the adoption of suitable crop rotations. Where potatoes are injured by wheat wireworms it is considered advisable to eliminate the sod crops from the rotation. The author's observations show that "infestations of wheat wireworms start in fields planted to hay or sod. Wireworms will increase in numbers if land is left in sod for two consecutive years. All the wireworms from a single infestation do not mature and emerge as beetles in three years. Beetles will occur in large numbers even in cultivated fields the second and third years following a sod, and a few will emerge in the fourth year. Marked decreases in larval populations and resultant injury to potato tubers will result from continued cultivation of infested fields."

Dutch elm disease control and the elm bark borer, E. P. FELT (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 315–319*).—A discussion is given of the Dutch elm disease, due to *Ceratostomella* (*Graphium*) *ulmi*, now generally established in the metropolitan area of New York, and the control of its bark beetle carriers, particularly the hickory bark beetle.

Flight studies of Bruchus pisorum L. (Coleoptera, Bruchidae), C. WAKELAND (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 534–542, figs. 5*).—This is a contribution from the Idaho Experiment Station in continuation of earlier observations in Oklahoma (E.S.R., 63, p. 756) on the pea weevil, which causes greater or less injury every year within an area known as the "Palouse region" of northern Idaho and eastern Washington.

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"Weevils were captured in greatest numbers near the surface of the ground, but many of them fly at least 70 ft. high in cultivated areas and at least 50 ft. above the ground at the edge of the forested areas a mile distant from pea fields. Large numbers of weevils leave the fields in the autumn and fly into timbered areas. . . . Trap records did not indicate that there was a definite direction of flight with respect to either location or to prevailing wind, for, although 58.6 percent of the total weevils were captured in traps facing away from the prevailing wind and toward the forested area, the proportions were reversed in many of the individual traps. Trap records indicated that there is a relatively small percentage of spring flight, and that a relatively small percentage of the weevils entering the forested areas in the autumn fly back toward the cultivated fields in the spring."

Effects of ultra violet radiations on the bean weevil (Bruchus obtectus Say), G. F. MacLeod (*Ann. Ent. Soc. Amer., 26 (1933), No. 4, pp. 603–615, figs. 5*).—In experiments with eggs, larvae, and adults of the bean weevil, the author found the eggs and first instar larvae to be killed by exposure to wavelengths of light shorter than 3,126 a.u. from a quartz-mercury arc. "Adults exposed to these same rays exhibited no marked effects, but eggs from these forms were largely sterile. Sublethal dosages produced forms which were defective in their metabolic processes, as was evidenced by the excessive amount of food consumed and failure to build a correspondingly greater body weight. Abnormalities of external structures were apparent in forms from both irradiated eggs and adults. Shortened elytra, or swollen abdomens, an abnormality accentuated in the third and fourth generations, [were] very common in progeny of all irradiated forms. Larvae developing as progeny of irradiated adults sometimes had a prolonged pupal period with the resulting forms becoming mixtures of larvae, pupae, and adults."

Control of weevils in stored beans and cowpeas, S. Marcovitch (*Tennessee Sta. Bul. 150 (1934), pp. 8, figs. 7*).—A practical summary of information on the bean weevil and the southern cowpea weevil.

Effect of various methods of storing corn on the degree of damage due to weevils, L. B. Uichanco and S. R. Capco (*Philippine Agr., 22 (1934), No. 9, pp. 653–672, figs. 3*).—This is a report of work conducted particularly with the rice weevil, practically the only form found to damage whole corn kernels, although 11 other species appeared later on weevil-damaged corn. Especial attention is given to the relation of moisture content of corn kernels to weevil damage.

"The uniformly higher coefficients of variation of infestation in all the lots wherein the husks and stigmas were not removed (125.28 to 255.94 percent) as compared with that in the shucked-ear lot (42.36 percent), after 7 mo. of storage, point to a decided weevil-excluding trend of this natural protection. Sun-dried ears, selected with full, tight-fitting shucks and stigmas, after 7 mo. in the storage room, had only 10.07 percent of the kernels damaged, or 56 percent that of the shucked ears. Sun-dried ears with shucks and stigmas intact but without selection, except for removal of those with broken or imperfect shucks that exposed the kernels, showed in the same length of time only a slight increase in damaged grains, 12.36 percent. Weevil damage in ears with broken or imperfect husks was 23.16 percent, or 129 percent that in shucked ears. Ears with shucks and stigmas on but stored without previous sun drying suffered the highest weevil damage, which was 30.78 percent of the kernels, or 171 percent that in shucked and sun-dried corn.

"Hence, shucks and stigmas can be depended on to protect the kernels only when these are not broken or imperfect and when the ears are sun dried before

storage. Otherwise, they encourage rather than deter infestation. Shucks on ears apparently serve, likewise, as a partial protection from rats."

The alfalfa weevil, E. O. ESSIG and A. E. MICHELBACHER (*California Sta. Bul. 567 (1933), pp. 99, figs. 16*).—This extended account of the alfalfa weevil, presented in connection with a 12-page list of references to the literature, deals with the systematic position, Old World distribution, spread in the United States, morphology and life history, climatic effects, host plants, destructiveness, dissemination, natural enemies, and artificial control.

Since its initial introduction into Utah the pest has spread into the States of Wyoming, Colorado, Idaho, Nevada, Oregon, and California. In California the insect first appeared east of the Sierra Nevada in Sierra County in 1923. Gradually its distribution extended into Plumas, Lassen, Alpine, and Mono Counties. By unknown agencies it was carried into the middle part of the State, being discovered in San Joaquin County in 1932. It now also occurs in Alameda, Contra Costa, Merced, Santa Clara, and Stanislaus Counties.

"Many methods for artificially controlling the alfalfa weevil are employed in the Great Basin of the United States. Among the most important farm practices are cultivating or disking the fields, pasturing, and the proper timing of the cuttings. The last is by far the most valuable method for reducing weevil populations and is the only one now used in many districts. The application of poisons as sprays and dusts has also proved effective. A spray composed of 2 lb. of powdered arsenate of lead or arsenite of zinc, 2 lb. of laundry soap, and 100 gal. of water, has been used with great success; the quantities given are sufficient for 1 acre. A dust prepared by mixing together equal parts of powdered calcium arsenate and dusting sulfur and applied at the rate of 5 lb. per acre has been used successfully in Nevada and elsewhere."

Experiments with kerosene emulsions against the apple curculio (Tachypterellus quadrigibbus Say), O. H. HAMMER (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 367–369*).—Contributing from the New York State Experiment Station, the author reports considerable evidence that the stomach poisons commonly used for spraying apple trees do not give satisfactory control of the apple curculio. Experimental work with infested fruits indicates that 50 and 25 percent kerosene emulsions give a high degree of kill. Concentrations of less than 25 percent gave varying degrees of kill.

The willow flea weevil, Orchestes rufipes Lec., and its control in Maine, R. W. NASH (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 336–339*).—*O. rufipes* was first called to the attention of the Maine Forest Service in 1926 as causing slight damage to the laurel-leaf willow (*Salix pentandra*) in the vicinity of Kennebunk Beach, and again came to attention in August 1931 when its injury was so severe that the foliage was either entirely browned or badly spotted. The injury was caused by the feeding punctures of the adults and the mines of the larvae.

The application of lead arsenate sprays and sodium fluosilicate and hydrated lime dusts gave but little kill of the adults. The application of Bordeaux mixture as a spray resulted in 87 percent less feeding punctures in cages and 33 percent less in the field. A contact spray of nicotine sulfate 1: 600 plus potash soap 1: 500 proved to be the most effective. Two applications must be made, however, the first to kill the adults and eggs at the time when eggs are first being deposited in numbers and the second about 3 weeks later to kill larvae and eggs. The two applications were found to give 90 percent control.

A revision of the genus Megachile in the Nearctic region.—Part I, Classification and descriptions of new species (Hymenoptera: Megachilidae), T. B. MITCHELL (*Amer. Ent. Soc. Trans., 59 (1933), No. 4, pp. 295–361,*

pls. 2).—In this contribution from the North Carolina Experiment Station, which revises one of the largest and most widely distributed of the genera of bees, 18 subgenera are erected and 43 species described as new.

The fluctuation of the population of Tiphia popilliavora Rohwer in the field and its possible causes, M. H. Brunson (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 514–518*).—A report of studies of this larval parasite of the Japanese beetle, first imported from Japan in 1920 and in 1927 found sufficiently abundant at the original points of liberation to warrant collection of females for redistribution. The data are presented under the headings of variations in host population, adaptation of parasite to third-instar host grubs, adult emergence from host grubs of different sizes and instars, and sex ratio of parasites reared on grubs parasitized in August.

The occurrence of Ascogaster carpocapsae in illuminated and sprayed areas of an apple orchard, D. L. Collins (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 379–382*).—The author found in work at the New York State Experiment Station that certain spray programs which are comparatively worthless in reducing codling moth population result in a great decrease in parasitism by *A. carpocapsae* Vier. The most effective sprays and the most efficient spray programs reduce the parasitism by *A. carpocapsae* in the order of their effectiveness against the codling moth. Light traps and bait pails, being an indirect means of reducing caterpillar populations, do not reduce the actual parasite population nor the percentage of parasitism to the extent brought about by a spray program which effects the same degree of host control.

The status of Tiphia vernalis Rohwer, an imported parasite of the Japanese beetle, at the close of 1933, J. W. Balock (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 491–496, fig. 1*).—The author here deals with the life history and habits of a larval parasite of the Japanese beetle introduced into this country in 1924 and first liberated in 1925. It was first obtained in 1927 and definitely proved to be successfully established in 1928. The author reports upon its life history and habits, importations, colonization, and the present status of the colonization project.

Comparative oviposition efficiency and collection costs of imported versus established Tiphia vernalis Rohwer, a parasite of the Japanese beetle, T. R. Gardner (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 497–499*).—This is an account of *T. vernalis*, first imported in adult form from Chosen (Korea) into the United States in 1926, a number of colonies of which had been established in New Jersey and Pennsylvania by 1932. The author considers comparative oviposition efficiency and collection costs.

Notes on Habrocytus cerealellae, parasite of the Angoumois grain moth, B. B. Fulton (*Ann. Ent. Soc. Amer., 26 (1933), No. 4, pp. 536–553, figs. 19*).—In the studies reported the life cycle of *H. cerealellae* (Ashm.) from egg to adult at 25° C. averaged 12.7 days for males and 13.7 days for females; at 30°, 10.2 and 11.1 days, respectively. Eggs obtained during the life of a single female varied from 97 to 676.

"Parasitism is possible only during the larval stage of the host after its cavity reaches the seed coat. Parasites oviposit on both active and paralyzed larvae. Parasite larvae are cannibalistic and rarely will more than one mature on the same host. One was reared on a rice weevil larva.

"The greatest diameter of the egg of *Habrocytus* is at least 12 times the internal diameter of the ovipositor through which it passes without causing noticeable expansion. The egg passes through the ovipositor like sand through an hourglass, one end emerging below before the remainder has left the body.

The elastic chorion is stretched through the ovipositor by downward pointing spines on the mesal faces of the stylets. The ovipositor is capable of bending in the middle by differential stresses on the two parts of the sheath, rendered possible by a laminated bridge at the base. The parasite feeds on host blood through a tube built from the seed coat to the host by viscous secretion from the ovipositor."

Predatory checks, especially birds, on the birch leaf-mining sawfly Phyllotoma nemorata Fallen, A. E. Brower (*Jour. Econ. Ent., 27 (1934), No. 2, pp. 342–344*).—Notes are presented on the natural enemies of *P. nemorata*, an introduced sawfly that first became epidemic in Maine in 1927.

Hyperparasitism in the case of some introduced lepidopterous tree defoliators, A. B. Proper (*Jour. Agr. Res. [U.S.], 48 (1934), No. 4, pp. 359–376*).—This contribution, based upon rearings from collections of cocoons or puparia of the parasites of the gypsy moth, brown-tail moth, satin moth, and the oriental fruit moth in New England, is presented in connection with a list of nine references to the literature. The information presented relates to (1) the extent to which these imported parasites are attacked by secondary parasites of the lepidopterous hosts, (2) the species concerned, and (3) the relative importance of each.

"Only 5 percent of the cocoons of *Apanteles lacteicolor* were proved to have been killed by secondary parasites, although not all the parasitization was measurable. Adult *Apanteles* issued from 55.1 percent of the total number collected, which is a higher percentage than is found in many of the other parasites. *Eupteromalus nidulans* was the chief hyperparasite. Parasitization of the cocoons of *A. melanoscelus* was found to be 32.5 percent in the first generation and 84.4 percent in the second. No effort was made to obtain a large collection of the second-generation cocoons, but of the small number received, adult *A. melanoscelus* issued from 10 percent. *Eurytoma appendigaster* was the most abundant parasite of the cocoons of both generations.

"Hibernation cocoons of the parasite *A. solitarius* yielded 27 percent of hyperparasites, and those formed during the summer showed 20 percent attack by secondaries. Adults of *A. solitarius* issued from half of the hibernation cocoons and from 64 percent of those of the summer generations. *Dibrachys boucheanus* was by far the most abundant parasite of the cocoons of all generations.

"Thirty percent of the cocoons of *Meteorus versicolor* were killed by parasites, and 60 percent yielded adults of *Meteorus*. *Hemiteles tenellus* was the chief parasite.

"Of the individuals of *Eupteromalus nidulans* collected from all sources, 19 percent were killed by secondaries, and most of the remainder issued as adults. *Pleurotropis nawaii* was the only secondary parasite of any importance.

"The parasitization of *Compsilura concinnata* is presented as found in relation to the three important primary hosts. As a parasite of the brown-tail moth, *C. concinnata* was attacked chiefly by *Monodontomerus aereus;* as a parasite of the gypsy moth, chiefly by *D. boucheanus;* and as a parasite of the satin moth, in the few cases found, by several equally.

"Parasites killed 23.6 percent of the puparia of *Sturmia nidicola*, and adult *Sturmia* issued from 40 percent. *M. aereus* was the most common secondary parasite.

"The parasitization of *S. scutellata* was found to be 11 percent, with *Brachymeria compsilurae* responsible for 9 percent of it in the present study

and 8 percent when based on a total number of 24,070 puparia obtained in another experiment. Adult *S. scutellata* issued from 38.5 percent and 48 percent of the puparia in the two groups.

"Eighteen puparia of *Carcelia laxifrons* collected showed 2 (11 percent) parasitized, 1 each by *B. compsilurae* and *M. aereus*. Adult *Carcelia* emerged from 8 of the remaining.

"Three puparia of *Tachina mella* yielded 1 adult fly, 1 killed by *M. aereus*, and 1 dead from an unknown cause. No parasitization was found in the puparia of *Chaetexorista javana*, although a single puparium obtained in another experiment contained adults of a species of *Melittobia*."

The brown dog tick, A. McIntosh (*North Amer. Vet., 14 (1933), No. 8, pp. 31–35, figs. 2*).—This article on the morphology, biology, distribution, and control of the brown dog tick, presented in connection with a list of 14 references to the literature, is supplemented by additional suggestions for controlling the pest.

The isolation from the Rocky Mountain wood tick (Dermacentor andersoni) of strains of Bact. tularense of low virulence for guinea pigs and domestic rabbits, G. E. Davis, C. B. Philip, and R. R. Parker (*Amer. Jour. Hyg., 19 (1934), No. 2, pp. 449–456*).—The authors report having isolated three strains of *Bacterium tularense* of low virulence for rabbits and guinea pigs from *D. andersoni*. The occurrence in nature of strains of *B. tularense* of different degrees of virulence is indicated. It is thought that the use of both guinea pigs and domestic rabbits will prove of advantage in making tests to determine the relative virulence of the strains.

Notes on the life history of the hour-glass spider, P. B. Lawson (*Ann. Ent. Soc. Amer., 26 (1933), No. 4, pp. 568–574*).—The notes presented relate to *Latrodectus mactans* Fab., which occurs throughout the United States.

Nematodes parasitic in Philippine cockroaches, B. G. and M. B. Chitwood (*Philippine Jour. Sci., 52 (1933), No. 4, pp. 381–393, pls. 3*).—A study made of a small collection of nematodes taken from *Panesthia javanica*, a cockroach native to the Philippines, resulted in the discovery of five species and a variety of nematodes, four of which species are new to science, one representing a new genus (*Leidynemella*).

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of the twenty-sixth annual meeting, December 1–2, 1933 (*Amer. Soc. Anim. Prod. Proc., 1933, pp. 324, figs. 15*).—This is the report of the annual meeting held at Chicago, December 1 and 2, 1933 (E.S.R., 69, p. 404). The following papers were presented in the dairy cattle, beef cattle, horse, swine, sheep and lambs, nutrition, and meats sections:

In the Next Quarter of a Century, by G. C. Humphrey (pp. 11–15); Needless Repetition in Animal Husbandry Experiments, by A. J. Glover (pp. 16–20); Getting More Value from Feeding Experiments, by F. B. Morrison (pp. 27–34); Molasses Incorporated in Grain Mixtures, by G. Bohstedt, B. H. Roche, J. M. Fargo, I. W. Rupel, J. G. Fuller, and P. E. Newman (p. 52); Dairy Sire Evaluation, by E. E. Heizer (p. 52); The Genetic History of the Holstein-Friesian Breed, by J. L. Lush and J. C. Holbert (p. 52); Production in a Large Jersey Herd as Affected by Sires, Dams, and Yearly Variations, by M. Plum (pp. 53–57); Vitamin A in the Nutrition of Dairy Cattle, by E. B. Meigs and H. T. Converse (pp. 58–61); Standards of Steer Judging, by G. Porteous (pp. 62–64); The Effect of Soybeans upon the Firmness of Beef

Fat, by B. H. Thomas and C. C. Culbertson (pp. 65–70); The Relative Value of Cottonseed Meal, Linseed Meal, and Corn Gluten Meal in Fattening Cattle Rations, by A. D. Weber (pp. 70–72); Corn and Cottonseed Meal in Beef Fattening Rations, by F. R. Edwards (pp. 73, 74); Systems of Pasture Utilization, by J. E. Comfort and E. M. Brown (pp. 74–77); Utilizing Grass in Fattening Young Cattle for the Market, by C. W. McCampbell (pp. 78–81); Fattening Yearling Heifers on Alfalfa Pasture, by M. L. Baker (pp. 81, 82); The Increasing Importance of Forage, by E. W. Sheets (pp. 83–85); Phosphorus Supplements in Beet By-product Rations, by E. J. Maynard (pp. 86–89); A Proposed Record of Performance for Beef Cattle, by L. M. Winters and H. McMahon (pp. 90–92); Corn and Cob Meal for Fattening Steers, by E. B. Powell (pp. 92–95); Cottonseed Hulls in Baby Beef Rations, by W. L. Blizzard (p. 95); Creep-Feeding Beef Calves, by C. I. Bray (pp. 96–98); Alfalfa and Wheat Hays for Fattening Calves, by R. McCall (pp. 98–100); Feeding Draft Colts, by R. S. Hudson (pp. 104–106); Energy Expended by a Horse at Rest and at Work, by R. C. Proctor, M. M. Jones, S. Brody, and D. W. Chittenden (pp. 106–109); Marketing Purebred Stallions as Foals, by A. L. Harvey (pp. 109–112); Our Industry—Where Are We? Where Are We Going? by A. B. Caine (pp. 113–116; The Pulling Ability of Horses as Shown by Dynamometer Tests in Illinois, by W. M. Dawson (pp. 117–121); Prevention of Disease in Foals, by W. W. Dimock (pp. 123–126); Variations in Rate of Gain and Feed Utilization of Similarly Fed Pigs, by E. Z. Russell and C. E. Aubel (p. 126); Nitrogen Balance in Pregnant Rats, by C. P. Thompson (p. 126); The Hemoglobin Level of Pigs at Various Ages, by A. W. Craft and L. H. Moe (pp. 127–131); Nutrition of Suckling Pigs, by A. G. Hogan, L. A. Weaver, and S. R. Johnson (pp. 131–134); Marketing Problems That Challenge the Swine Industry, by R. C. Ashby (pp. 134–138); Rock Phosphate as a Mineral Feed for Swine, by J. M. Fargo, G. Bohstedt, E. B. Hart, and P. H. Phillips (pp. 138–141); The Comparative Efficacy of "Dicapho", Bone Meal, and Limestone When Fed as Mineral Supplements to Rations for Pigs, by B. H. Thomas, C. C. Culbertson, J. M. Ramsbottom, and W. E. Hammond (pp. 142–144); Minerals and Protein Feeds for Pigs on Forage, by W. L. Robison (pp. 145–148); The Effect of a Complex Mineral Mixture on Reproduction in Swine, by W. P. Elmslie (pp. 148–150); The Effects of Soybeans and Soybean Products on Pork Quality, by C. M. Vestal and C. L. Shrewsbury (pp. 151–154); The Optimum Degree of Fineness of Grinding Corn for Growing and Fattening Swine, by M. A. McCarty, J. E. Nicholas, and T. B. Keith (pp. 155, 156); The Value of Feeding Grain to Unweaned Lambs on Pasture, by C. Harper (pp. 157–159); Crossbreeding in the Production of California Spring Lambs, by R. F. Miller (p. 162); A Comparison of the Growth of Purebred Cheviot and Crossbred Ryeland × Cheviot Lambs, by L. J. Horlacher (p. 163); The Nutritional and Genetic Aspects of Wool Production, by R. H. Burns (pp. 164–169); Crossing of Different Breeds of Sheep for Hothouse Lamb Production, by W. L. Henning and T. B. Keith (pp. 173–175); The Calcium and Inorganic Phosphorus Content of Sheep Blood, by C. H. Kick and D. S. Bell (pp. 175–177); Effect of Plane of Nutrition on the Milk Production of Ewes and the Weights of Their Lambs, by M. G. Snell (pp. 178–180); Status of Sheep Registration in the United States, by D. A. Spencer (pp. 181–183); Purebred Sheep Registration, by F. S. Hultz (pp. 183–185); The Influence of Nutrition on Reproduction in the Sheep, by A. E. Darlow and L. E. Hawkins (pp. 186–189); The Nutritive Value of Winter Wheat Straw, by J. Sotola (pp. 189–192); Problems in Vitamin Nutrition, by R. M. Bethke (pp. 224–228); Relations between the Metabolism of Protein and of

Energy, by H. H. Mitchell (pp. 229–232); The Genetics of Growth, by S. Wright (pp. 233–237); The Use of the Method of Partial Regression in the Analysis of Comparative Feeding Trial Data, by E. W. Crampton and J. W. Hopkins (pp. 238–240); The Influence of Phosphorus Deficiency on the Metabolizable Energy of the Ration, by J. S. Hughes, W. H. Riddell, and J. B. Fitch (pp. 241–243); Weight Records on Purebred Beef Cattle during Growth, Gestation, and Lactation, Together with Data on Reproduction, by H. R. Guilbert and A. McDonald (pp. 244–253); Calcium and Phosphorus Content of Pasture Grasses and Legumes, by R. H. Lush (pp. 254–257); and Eight Years of Cooperative Meat Investigations, by O. G. Hankins (pp. 294–297).

[Experiments in animal production by the Ohio Station] (*Ohio Sta. Bul. 532 (1934), pp. 67, 68, 69, 70, 71–74, 94, 95*).—Brief reports are given of the results of studies on an all-purpose protein supplement for beef calves, growing and fattening lambs, breeding ewes, pigs, laying hens, and dairy cows, by P. Gerlaugh, [S. M.] Salisbury, W. L. Robison, D. S. Bell, and D. C. Kennard; the quality of hays involving protein and vitamin G, by C. H. Hunt, R. M. Bethke, and P. R. Record; cane molasses for fattening calves, by Gerlaugh; relative efficiency and profitableness of three grades of feeder steers, by Gerlaugh and C. W. Gay; corn-and-cob meal v. shelled corn for fattening calves, by Gerlaugh and [H. W.] Rogers; feeding oats to cattle, by M. A. Bachtell; forage crops for growing and fattening pigs, a comparison of tankage with mixed proteins for hogs, need of minerals with heavy grain feeding of hogs, forage needs of shotes during fattening, and lack of vitamin A not the chief cause of cottonseed meal injury in pigs, all by Robison.

In tests with sheep, results are reported on feeding dry rendered tankage as a protein supplement for growing lambs, by Bell; pasturing wheat with sheep, and Sudan grass v. soybeans and Sudan grass as pasture, both by Bell and L. E. Thatcher.

The poultry experiments yielded information on individual laying batteries for hens, triple-purpose pen batteries, a comparison of fresh range, contaminated range, and wire screen porch for production of pullets, all by Kennard and V. D. Chamberlin; the effect of fluorine in the nutrition of the chick, by C. H. Kick, Bethke, and Record; the comparative nutritive value of different fish meals for chicks, by Record, Bethke, O. H. M. Wilder, and Kennard; the relation of the vitamin G complex to hatchability and nutritive value of the eggs, by Bethke and Record; and effect of equivalent units of vitamin D in the form of a cod-liver oil concentrate and irradiated ergosterol on hatchability and the vitamin D content of the egg, by Bethke, Record, and Wilder.

An apparatus for automatically measuring the respiratory exchange of small animals, H. G. Lewis and J. M. Luck (*Jour. Biol. Chem., 103 (1933), No. 1, pp. 209–226, figs. 4*).—The authors describe a closed circuit type of apparatus which permits automatic measurement of the respiratory metabolism of small animals. Oxygen consumption is measured electrically by the rate at which water must be admitted to maintain a constant pressure in the system. The rate of carbon dioxide production is measured electrically by the change in conductivity of an absorbing solution of barium hydroxide.

In this apparatus it was determined that the basal metabolic rate of male rats weighing 220 g, fasted for 36 hr., and at an environmental temperature of 28° [C.] averaged 744 calories per square meter of body surface per day.

Determining the age of farm animals by their teeth, G. W. Pope (*U.S. Dept. Agr., Farmers' Bul. 1721 (1934), pp. [2]+14, figs. 31*).—This is a revision of and supersedes Farmers' Bulletin 1066 (E.S.R., 41, p. 769), including horses and mules, cattle, sheep and goats, and swine.

The effect of the curing process upon the carotene and vitamin A content of alfalfa, W. C. RUSSELL, M. W. TAYLOR, and D. F. CHICHESTER (*New Jersey Stas. Bul. 560 (1934), pp. 8, fig. 1*).—Continuing the comparison of the effect of curing upon some of the nutritive properties of alfalfa hay (E.S.R., 63, p. 856), both the biological assay and the determination of carotene revealed that artificially dried alfalfa had a higher vitamin A content than field-cured alfalfa. The degree of difference was determined by the length and conditions of field curing. In this work the machine-dried product had from 2 to 10 times the vitamin A value of the field-cured.

Although complete agreement was not always obtained between the biological response and the carotene content of samples of alfalfa, it was concluded that the carotene content was at least an approximation of the vitamin A value. The carotene content of artificially dried samples was not less than that of freshly cut material from the field. Storing dried, finely ground alfalfa in vacuo at 0° ± 5° F. was effective in preventing significant losses of carotene during a biological assay. In field curing there was a progressive destruction of carotene, especially during the daylight hours. In the first 24 hr. alfalfa lost not less than 80 percent of its original carotene content when field cured.

The nutritive value of kolukkattai grass (Pennisetum cenchroides) dried artificially, T. MURARI (*Agr. and Livestock in India, 2 (1932), No. 4, pp. 380–382*).—Tests with two lots of 10 calves each at the Livestock Research Station, Hosur, showed that 1.75 lb. of artificially dried kolukkattai grass was equal to 1 lb. of equal parts of peanut cake and wheat bran.

Oat hulls as a source of vitamins B and G, N. B. GUERRANT and R. A. DUTCHER (*Poultry Sci., 12 (1933), No. 6, pp. 373–377, figs. 2*).—The results of a study at the Pennsylvania Experiment Station dealing with the relative amounts of vitamins B and G present in a typical sample of oat hulls are presented. Rats were fed a basal diet complete in every respect except for these vitamins.

The oat hulls were found to contain appreciable amounts of vitamins B and G. Animals receiving the basal diet supplemented with 5 percent of oat hulls were found to live considerably longer than those on the basal diet. A supplement of 10 percent resulted in slow but consistent growth, while 20 percent of the hulls produced a 5-g gain per week during the 8-week period. Vitamin B and G concentrates added to this basal diet were approximately equally effective in stimulating additional growth. While 20 percent of extracted hulls was not sufficient to stimulate growth when used as a supplement to the basal diet, there was some evidence that it did prolong life.

Pea husks as a livestock foodstuff, W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust., 36 (1933), No. 11, p. 1252*).—Chemical analysis showed that the husks of field peas with a starch equivalent of 37.2 percent had a little better fattening value than wheat hay chaff with a starch equivalent of 31 percent. The nutritive ratios of the two feeds were 1:9 and 1:15.2, respectively. Pea husks and lucerne hay chaff were practically equal for fattening, but the narrower nutritive ratio of the lucerne, 1:3.5, indicated that this was a better feed for milking cows. The skins of peanut kernels had a starch equivalent of 49.2 percent and a nutritive ratio of 1:7.4.

Farm sheep facts, M. A. ALEXANDER and W. W. DERRICK (*Nebraska Sta. Circ. 48 (1934), pp. 19, figs. 8*).—A summary of 117 facts regarding sheep production in Nebraska, dealing with marketing, breeding, management, grading and scouring wool, and parasite control.

Sheep sickness of permanent pasture, E. J. ROBERTS (*Jour. Min. Agr. [Gt. Brit.], 40 (1933), No. 4, pp. 337–343, fig. 1*).—A temporary pasture in its fourth and fifth years at the University College of North Wales produced 46 and 89

percent, respectively, more increase in live weight of sheep than a fairly good permanent pasture. The greater production of the temporary pasture was largely due to its greater carrying capacity.

A condition of lambs sometimes attributed to the grazing of "sheep sick" land was observed among the lambs on the permanent pasture in September. It has not been determined whether this condition was due to parasitism or to a nutritional defect. The condition, however, is discussed on the basis of the present knowledge of pastures.

Effect of shearing on hairiness in the fleece of the Romney lamb, K. M. Rudall (*New Zeal. Jour. Agr., 47 (1933), No. 1, pp. 20–28, figs. 6*).—A study at the Massey Agricultural College was undertaken to determine if shearing had any medulla-producing effect and to study the extent to which medullation occurs after shearing compared with the amount of hairiness which is produced in the first few months after birth.

It was found that shearing did not cause the appearance of medulla in the case of lambs with little or no hairiness in the tips of the fleece. Of the completely shorn lambs there was an increase of hairiness after shearing if the original fleece had had a distinctly hairy tip. In the case of lambs with hairy-tipped fleeces shorn on one side, more hair fibers appeared on the shorn side than on the unshorn side. If the original coat showed a marked hairy tip, a new hairy tip generally followed shearing. The new hairiness was strongest at the tip and generally tended to disappear after a time.

Swine feeding, E. W. Crampton (*Quebec Dept. Agr. Bul. 116 (1933), pp. [1]+37+[1], figs. 6*).—The principles of feeding, hog feeds and rations, feeding practices, and nutritional deficiency diseases and parasites of swine are discussed.

Forage crops for pigs, W. L. Robison (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 48–53*).—In this article the author describes the importance of providing an abundance of suitable pasture throughout the year and the characteristics and values of the different pasture crops for swine production.

Effect of quantity and kinds of feed on economy of gains and body composition of hogs, N. R. Ellis and J. H. Zeller (*U.S. Dept. Agr. Tech. Bul. 413 (1934), pp. 31, figs. 3*).—Data are reported on the influence of limited and full rations on the economy of gains and body composition of 89 pigs individually fed between 1924 and 1932. Three different types of rations were employed. In three of the experiments the feeds consisted of from 70 to 82.7 percent of shelled peanuts. In two of the experiments the feed was mainly yellow corn and wheat middlings, and in one experiment 84 percent of wheat was fed. In most of the tests lots of pigs were approximately full-fed, whereas other lots received about 50 percent (low) and others 70 percent (medium) of that amount.

Although more rapid gains were made generally by the full-fed pigs, those receiving the medium ration of shelled peanuts made an average daily gain of 1.15 lb. in one test and 0.95 lb. in the other as compared, respectively, with 0.96 and 0.85 lb. daily gain made by the full-fed pigs and 0.71 and 0.69 lb. daily gain made by the low-fed pigs. The feed consumption per unit of gain showed a significant decrease with the lower levels of feeding. However, on the peanut ration differences between feed requirements per unit of gain on the low level and the medium level were not significant.

On the corn and wheat ration the group on the high-feed level required 34 percent more feed than the group on the low-feed level. However, there were not such great differences in the feed required per unit of gain on the three levels of feeding with the wheat ration as in the case of the other rations. The

carcasses of the pigs on the peanut rations showed no significant differences as regards fatness, but a significantly greater proportion of lean meat was obtained by the limited feeding of the corn and wheat rations. The restricted feeding resulted in a slight decrease in the firmness of the carcasses of the corn-fed lots, i.e., those carcasses with the thickest back fat layer were the firmest. No significant differences were apparent in the palatability of the cooked meat from the lots receiving different levels of feeding on the corn and wheat rations. The results emphasize the importance of controlling the feeding levels in hog-feeding experiments and the importance of such control on rate of gain, efficiency of feed utilization, and composition of the carcass.

Cutting yields of hogs an index of fatness, K. F. WARNER, N. R. ELLIS, and P. E. HOWE (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 3, pp. 241–255, figs. 2*).—A study of the relationships between the percentage of fat in the edible portion of the carcass and the percentage yields of the fat and the lean cuts in 75 hogs of different weights showed that the combined weight of the cutting fat and belly expressed as percentage of the weight of the entire cold carcass gave a relatively good indication of the fat in the edible portion of the carcass, the correlation being $+0.91\pm0.01$. A high correlation of $+0.92\pm0.01$ was also obtained between the percentage of fat in the edible portion of the carcass and the ratio between the percentage of the two fat and two lean cuts (ham and loin). A relatively good correlation of $+0.84\pm0.02$ was obtained between the percentage yield of the belly and back fat alone and fat percentage in the edible carcass. The index of fatness based on the percentage yield of the belly and cutting fat was applied to 523 additional carcasses of different ages and weights and was found to offer possibilities as a practical and reliable index of fatness. When the carcasses were classified by sex, it was found that barrows were consistently somewhat fatter than gilts.

Physical characteristics of hog carcasses as measures of fatness, O. G. HANKINS and N. R. ELLIS (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 3, pp. 257–264, figs. 2*).—The data from measurements made on 60 hog carcasses have been studied in their relationship to the chemical composition of the edible meat for the purpose of securing a simple and convenient method of measuring the fatness of the carcass. The average thickness of back fat from measurements made at five specific points when correlated with fat content gave a correlation coefficient of $+0.84\pm0.04$. This is somewhat less than the coefficients representing the relationship between (1) the chemically determined fat content of the edible portion of the carcass and that of the trimmed right hams and (2) the fat content of the carcass and the sum of the percentages of trimmed belly, leaf fat, back fat, and fat trimmings. However, the results show that for representative animals the average thickness of back fat is a hog-carcass characteristic of very definite value for estimating the fatness of the edible portion of the carcass. Of other carcass measurements and ratios based upon the measurements which were also studied, none of the correlation coefficients were so high as that representing the relationship between the average thickness of back fat and the fat content of the carcass.

Bulkiness of food as a factor in poultry feeding, T. SHAW and E. A. FISHER (*Jour. Min. Agr.* [*Gt. Brit.*], *40* (*1933*), *No. 4, pp. 327–337*).—In this series of tests it was demonstrated that the bulkiness of the individual feeding stuffs was not an important factor in the practical feeding of poultry. The bulk of dry bran was not detrimental to its use in considerable amounts in poultry mashes. The bulkiness of the entire ration and not of its individual constituents must be considered in compounding rations. In a wet mash bulk is of more importance than it is in the same mash when dry.

It was shown that bran could be included in either dry or wet mashes at the rate of from 35 to 40 percent of the mixture without limiting the feed consumption of the birds or the supply of nutrients necessary for high egg production.

New nutritional factors required by the chick, J. A. KEENAN, O. L. KLINE, C. A. ELVEHJEM, E. B. HART, and J. G. HALPIN (*Jour. Biol. Chem., 103 (1933), No. 2, pp. 671–685, fig. 1*).—The Wisconsin Experiment Station undertook a study to demonstrate that a synthetic diet containing ample amounts of vitamins A, B_1, B_2, and D would not support normal development in young chicks until two additional factors, both present in liver, were supplied. It was also intended to prove that one of these factors was identical with vitamin B_4 (E.S.R., 65, p. 594).

A simplified diet of casein, dextrin, salt mixture, yeast, and cod-liver oil fed to day-old White Leghorn chicks failed to produce normal growth, and the chicks developed a typical paralysis at about 3 weeks of age. Adding 18 percent of vacuum-desiccated hog liver to the diet resulted in normal growth and freedom from paralysis. Even after ether extraction the liver retained its potency. This defatted liver substance contained two factors, one insoluble in water and necessary for normal growth and the other soluble in water and necessary for the prevention of paralysis. When autoclaved at its natural pH, the antiparalytic factor of the liver was destroyed but the growth factor was not affected. Evidence is presented to show that the antiparalytic factor was probably identical with vitamin B_4.

Effect of fluorine in the nutrition of the chick, C. H. KICK, R. M. BETHKE, and P. R. RECORD (*Poultry Sci., 12 (1933), No. 6, pp. 382–387*).—The Ohio Experiment Station carried on with White Leghorn chicks a series of four tests using various forms of fluorine as a mineral supplement to a basal diet.

It was found that chicks could tolerate more fluorine in the form of calcium fluoride than in the form of rock phosphate or sodium fluoride. The fluorine of the latter supplements exerted similar effects on growth and feed consumption. When chick rations contained more than 0.036 percent of fluorine in one or the other of these forms, growth and feed consumption were decreased in direct proportion to the fluorine content of the ration. The fluorine ingested did not significantly affect the percentage of bone ash in the tibias at 8 weeks of age. The clotting time of the blood was reduced in chicks fed increased amounts of fluorine in the form of sodium fluoride or rock phosphate.

The effect of different calcium intake levels on hatchability and eggshell formation (*Rhode Island Sta. Rpt. [1933], p. 75*).—The influence on hatchability and eggshell strength of rations containing 0.24, 0.37, 0.66, and 1.05 percent of calcium in the mash was tested.

Individuality of pullets in balancing the ration, J. C. GRAHAM (*Poultry Sci., 13 (1934), No. 1, pp. 34–39*).—Using six Rhode Island Red pullets housed in individual compartments in a battery, the Massachusetts Experiment Station conducted a test over a 30-week period to determine the ability of birds to balance their diet. Whole corn, whole oats, and mash were fed ad libitum.

The intake of the individual feeds varied considerably for each bird from day to day and week to week. However, the variation in protein level for individual birds from day to day was small. Some individuals produced well and gained weight on a 12 to 13 percent protein level, while others used a 14 to 15 percent level. Nonlaying birds were thrifty and prepared to lay on an 11 percent level. Habit appeared to play an important part in the diet of individual birds, and some were extremely constant in their protein intake

level over long periods. The results indicate that nutritional requirements are governed by an urge of the organism.

The preservation of skimmilk curd for poultry feeding, R. N. DAVIS (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 495–499*).—The Arizona Experiment Station undertook a study to find a practical method for preserving skim milk curd on the farm in a satisfactory condition for poultry feeding and to determine the length of time the curd may be held.

It was found that skim milk curd could be preserved for 6 mo. or longer by adding formalin (40 percent formaldehyde) at the rate of 1:1,000. The acidity of the whey must be at least 0.7 percent at the time the formalin is added. This preserved curd was a good source of animal protein for poultry.

A comparison of confinement and range for laying stock, A. B. GODFREY and H. W. TITUS (*Poultry Sci., 13 (1934), No. 1, pp. 56–60, figs. 2*).—The U.S.D.A. Bureau of Animal Industry conducted three experiments to compare the performance of birds confined to a laying house with birds having access to a limited range.

Confined birds that received cod-liver oil and sunshine laid as many eggs as, and tended to lay larger eggs than, birds on limited range. Confined birds receiving sunshine but no cod-liver oil showed no significant difference in production or egg size as compared with the limited-range birds. When birds were confined there was a tendency to lay a larger number of eggs during the winter months, while birds on limited range tended to lay a larger number of eggs during the spring months. No deleterious effects on fertility or hatchability were noted in confined birds if cod-liver oil was fed.

Chicken battery comments, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 53–58, figs. 2*).—This paper contains additional results, developments, and experiences in battery tests for chickens (E.S.R., 69, p. 570). The following phases of this method of raising poultry are discussed: Individual laying batteries, the mite problem, watering devices, triple-purpose pen batteries, and battery brooding.

Sex characters of battery brooder and colony-raised White Leghorns, G. D. BUCKNER, W. M. INSKO, JR., and J. H. MARTIN (*Poultry Sci., 12 (1933), No. 6, pp. 392–396*).—Continuing the studies on sunshine and battery brooder confinement (E.S.R., 70, p. 667), the Kentucky Experiment Station divided cockerels into three groups following the removal of the comb or comb and wattles of some birds at 4 weeks of age. At 6 weeks the first group was transferred from the battery brooder to a colony brooder with access to a grass yard. In the second group the birds were confined to the battery brooder for 24 weeks. The third group of birds, confined in battery brooders, received 2 hr. sunshine every sunny day.

The testes of cockerels raised where they had access to direct sunlight were larger than the testes of cockerels raised in battery brooders. The removal of the comb or comb and wattles also reduced the size of the testes. The combs of birds raised in battery brooders both with and without contact with sunlight were larger than those of birds raised in colony brooders. The wattles of birds raised in battery brooders with sunlight or in colony brooders were larger than those of birds raised under similar conditions but with their combs removed. The combs of birds raised out of contact with sunlight were abnormally large and decidedly lopped as compared with the small erect combs of birds receiving sunlight.

The results of a test with pullets, some of which had their combs removed at 4 weeks of age, showed that such an operation apparently had no effect on

the size of the ovaries up to the fourteenth week. When growing pullets raised in indoor battery brooders were allowed 2 hr. of direct sunshine on each sunny day, they were more vigorous and healthier.

Does increased light absorption cause increased egg production in the fowl? T. H. BISSONNETTE (*Poultry Sci., 12 (1933), No. 6, pp. 396–399*).—In this article the author briefly discusses some of the experimental work on the effect of increased light absorption on some of the vital activities of animals. A list of references to work of this character that may be of interest to workers in poultry science is appended.

R.O.P. progeny testing, C. W. KNOX (*Poultry Sci., 12 (1933), No. 6, pp. 349–351*).—In this paper from the U.S.D.A. Bureau of Animal Industry the author discusses a modification of the present poultry Record of Performance work. The principle of this improved method is that of progeny testing. In order to complete this method two phases of testing would be necessary—(1) inspection and gathering of a random sample of eggs to be shipped to a central breeding station and (2) the raising of a flock of pullets at the central breeding station.

Progeny testing in breeding for egg production, M. A. JULL (*Poultry Sci., 13 (1934), No. 1, pp. 44–51*).—The U.S.D.A. Bureau of Animal Industry found in a flock of 793 White Leghorn daughters representing the progeny of 19 selected sires and 135 selected dams that in some cases the average egg production of the daughters of different sires varied significantly, while between other sires there was no significant difference. A given sire mated to a given dam may produce good progeny, but the same sire mated to another dam may produce poor progeny. The same was true of the female matings. Even full sisters mated to the same sire may produce widely different results.

A dam's egg record could not be used as a criterion of her breeding potential, nor could the egg record of a sire's dam be used as an index of his breeding potential. The average egg production of a group of full sisters was not an index of the breeding potential of any individual in the group.

It was concluded that the significance of progeny testing in breeding for egg production is determined by the results secured from a given mating.

Egg laying contests, C. S. PLATT (*N.J. Agr., 16 (1934), No. 2, p. 5*).—An account is given of the annual result of the egg-laying contests and one pigeon-breeding contest.

Results of seven years of egg-laying contests, B. ALDER (*Utah Sta. Bul. 248 (1934), pp. 28, figs. 5*).—An account is given of the feeding, production, temperature, and other similar records available from the Utah intermountain egg-laying contests for the period 1924–31 (E.S.R., 63, p. 667).

Egg weight in the domestic fowl, E. M. FUNK and H. L. KEMPSTER (*Missouri Sta. Bul. 332 (1934), pp. 15, figs. 3*).—The relation of the weights of the eggs produced in four successive years in the station flocks to various conditions of production is reported.

The heaviest eggs were produced in February and those of the smallest weight in July, irrespective of the season or of sexual maturity. Although the age of the pullets at sexual maturity definitely influenced the size of the first 10 eggs laid, it was not closely related to maximum and average egg weight. Body weight at first egg was also definitely related to the weight of the first 10 eggs laid. It was found that the first egg laid after a pause was slightly smaller than the last egg laid before the pause.

Eggs produced in the morning were definitely larger than those laid during the afternoon. In reference to regularity of production where clutches of eggs were laid successively it was usually found that the first egg in such clutches

was the largest egg laid in that clutch, and the decrease in the weight of succeeding eggs was much greater in case the first egg was unusually large than if the first egg was small. Greater decreases in the weight of eggs within a clutch were shown in the spring than during the fall and winter seasons of production. The breeds employed were arranged in the following order as regards the average weight of the eggs, beginning with the largest: Rhode Island Red, Barred Rock, White Rock, Ancona, Wyandotte, and White Leghorn.

A correlation of 0.288±0.06 between the average egg weights of dams and the average egg weights of their daughters is taken to indicate the inheritance of egg weight.

Some factors affecting egg size in the domestic fowl, N. L. Bennion and D. C. Warren (*Poultry Sci., 12 (1933), No. 6, pp. 362–367, fig. 1*).—The Kansas Experiment Station studied the records of 125 White Leghorn and 50 Rhode Island Red birds for the years 1921–22.

With Leghorn pullets there were indications that there was a gradual decrease in size with each successive egg in the clutch. The longer the clutch the greater was the decrease from first to last egg, but the smaller was the decrease of each egg within the clutch. After a pause of 7 or more days in production the first egg of Rhode Island Reds showed a decrease of 4.1 g from eggs similarly situated before the pause. With Leghorns this decrease was 2.3 g. Normal size was recovered in the second or third egg after production was resumed. During the early production period of pullets when egg size was on the increase there was a smaller decrease of successive eggs in a clutch than was true when birds reached their maximum egg size. Small egg size was not associated with high annual production. The higher producing birds maintained a larger mean weekly egg size during the year.

Methods of estimating the mean egg weight per bird for the first year production, A. B. Godfrey (*Poultry Sci., 12 (1933), No. 6, pp. 368–372, fig. 1*).—In this statistical study at the U.S.D.A. Animal Husbandry Experiment Farm, Beltsville, Md., the weights of all eggs laid by 69 White Leghorn pullets for one complete laying year and by 124 birds for 11 mo. were available. The egg production varied from 121 to 265 eggs, and the mean annual egg weight was 55.1±0.24 and 55.6±0.2 g, respectively.

The analyses led to the conclusion that an approximation of the mean annual egg weight could be detected at the beginning of the pullet laying year from a knowledge of the average weight of the first 10 eggs, the body weight at first egg, and the age at first egg. A reliable estimate of mean annual egg weight of all eggs could be determined by weighing the eggs laid by each bird the first 4 days of each month. However, a more reliable and a more readily obtained estimate of mean annual egg weight of all eggs for each bird could be had by computing the mean weight of the eggs laid by each bird on any specified day of the week throughout the first laying year.

Initial egg weight as a basis of prediction of maximum egg size, W. Wilson and D. C. Warren (*Poultry Sci., 13 (1934), No. 1, pp. 52–55*).—The Kansas Experiment Station made a study of the relation of initial egg weight to adult egg weight in White Leghorn, Rhode Island Red, and Barred Plymouth Rock pullets.

It was found that the opportunity for a pullet to reach standard egg weight (56.7 g or 2 oz.) at maturity was determined to some extent by the month in which she started producing. The average egg weight of the three breeds differed, and this had a slight effect on the initial egg weight necessary to reach the standard. Only 12 pullets of the three breeds reached the standard when starting with an egg weight of less than 46 g in October, 50 g in November,

and 52 g in December or later. It is suggested that it probably would be profitable to eliminate soon after laying started those pullets which started production in the above months with eggs weighing less than 46, 50, or 52 g, respectively.

Firmness of albumen as an inherited characteristic, F. W. Lorenz, L. W. Taylor, and H. J. Almquist (*Poultry Sci., 13 (1934), No. 1, pp. 14–17, fig. 1*).—In work at the California Experiment Station a group of birds that laid eggs with the percentage of firm white significantly higher than the average was successfully raised. The group was composed of individual families which were significantly different in this character from families hatched from a low firm white line. The above results, together with the apparent relationship between inbreeding and the average percentage of firm white in the high line and in individual families of the high line, indicated the existence of genetic factors that at least partially controlled the percentage of firm white of the eggs laid.

The failure to lower the mean percentage of firm white of a group by selection, the apparent lack of consistent relationship between inbreeding and the mean percentage of firm white in the low line, and the actual segregation of relatively high families from the low line suggested the possibility that the factors for low were dominant to those for high percentage of firm white.

Variability of thick albumen in fresh-laid eggs, C. W. Knox and A. B. Godfrey (*Poultry Sci., 13 (1934), No. 1, pp. 18–22*).—The U.S.D.A. Bureau of Animal Industry found that for White Leghorns and Rhode Island Reds egg weight was highly correlated with the weight of total albumen and to a lesser extent with the weight of thick white. Egg weight was not significantly correlated with the percentage of thick white of total albumen in either breed, and in neither breed was antecedent egg production significantly correlated with total amount of albumen, amount of thick white, or percentage of thick white. There was no significant correlation between total egg production before July 1 and egg weight during the month of June in either breed. Leghorn eggs had a significantly greater percentage thick white of total albumen weight, and Rhode Island Red eggs were significantly heavier in weight. There was a standard deviation of 7.4 percent in the percentage of thick white of total albumen in Leghorn eggs and 8.6 percent in Rhode Island Red eggs.

Vitamin A in eggs, W. C. Russell (*N.J. Agr., 16 (1934), No. 2, p. 6*).—Determination was made of the vitamin A consumption and production in the eggs laid by fowls with reference to the possibilities of increasing the vitamin A value of the eggs by feeding.

A method of demonstration of a living bird's embryo, A. L. Romanoff (*Poultry Sci., 12 (1933), No. 6, pp. 388, 389, figs. 2*).—In this article from the [New York] Cornell Experiment Station the author describes a convenient method of demonstrating a living bird's embryo. The advantages of this method are (1) the simultaneous observation of all stages of embryonic development and (2) the continuous observation of the successive stages of the growth and development of the same individuals.

Studies in embryonic mortality in the fowl.—V, Relationship between positions of the egg and frequencies of malpositions, F. B. Hutt and A. M. Pilkey (*Poultry Sci., 13 (1934), No. 1, pp. 3–13*).—Continuing these experiments (E.S.R., 64, p. 621), the Minnesota Experiment Station studied the frequency of five malpositions of late chick embryos in eggs incubated horizontally and in others incubated at the same time but with the large ends raised about 45° up to the eighteenth day.

In the horizontal position the frequency of malpositions was 10.1 percent of 5,030 embryos alive at 18 days, or 60.4 percent of those dying after that age. With the large end raised the frequency of malpositions was 10.7 percent in 3,040 embryos alive at 18 days, or 65.9 percent in those dying after that age. Embryonic mortality was practically the same in both lots after 18 days.

The frequency of the malposition "head between thighs" was twice as great in tilted as in horizontal eggs, and "beak over wing" was 25 percent higher in the tilted position. "Head in small end" was twice as high and "rotated from air cell" three times as high in the horizontal as in the tilted eggs. "Head left" was somewhat more common in tilted eggs, but not consistently so.

It is pointed out that if the good features of both positions for incubation could be combined, the total mortality during incubation would be reduced by approximately 6 to 8 percent. The possible modes of origin of these malpositions and means of lessening their frequency are discussed.

Effect on mercurial ointment on hatchability, A. Deakin and G. Robertson (*Poultry Sci., 12 (1933), No. 6, pp. 378–381*).—The Dominion Experimental Farm, Canada, conducted a study to determine the effect of mercurial ointment used for ridding hens of body lice on hatchability, particularly with respect to its effect on hatchability of eggs from treated breeding stock when artificially incubated.

When eggs were set under hens treated with this ointment the embryos died before the third day of incubation. Eggs were set under treated hens for 48, 36, 24, 12, and 2 hr., respectively, and were then transferred to an incubator. The mortality rate decreased from a complete kill for the eggs set for 48 hr. to no apparent effect on the eggs under the hens for 2 hr. A few embryos of eggs treated directly with "light" and "heavy" doses (the size of an alfalfa seed and twice this amount, respectively) survived artificial incubation. These results indicated a resistance to the poison either on the part of the embryo or egg membranes. It was concluded that mecurial ointment should not be used on breeding stock during and for 2 to 3 mo. previous to the breeding season.

A statistical analysis of some experiments on slipped tendon, T. T. Milby (*Poultry Sci., 12 (1933), No. 6, pp. 352–355*).—In this report from the Iowa Experiment Station the author has made a statistical analysis of the literature in this field to determine whether or not there is any constant relationship between certain constituents of the ration and the incidence of slipped tendon.

There was a highly significant positive correlation, 0.6303, between the amount of phosphorus in the ration and the percentage of slipped tendon. The multiple correlation was not sufficiently larger than the simple correlation between phosphorus and slipped tendon to make its use advisable in place of the latter. The phosphorus content of the ration gave practically as good an estimate of the amount of slipped tendon as did protein, ash, calcium, and phosphorus combined. Taking into account the variation in percentage of slipped tendon due to correlation lowered the standard deviation of the percentage of slipped tendon 29.06, to the standard error of estimate, 22.74, a reduction of 21.8 percent. On this basis there was no justification for the conclusion that phosphorus is the principal cause of slipped tendon, but the results indicate that high percentages of slipped tendon are associated with high phosphorus rations.

Mineral content of tibiae from chicks with slipped tendon, A. D. Holmes, M. G. Pigott, and W. B. Moore (*Poultry Sci., 12 (1933), No. 6, pp. 356–361, fig. 1*).—The authors fed seven starting and growing mashes similar to those

used on commercial poultry farms. The ash content of the mashes varied from 7 to 9.2 percent, the calcium from 1.7 to 2.6 percent, and the phosphorus content from 0.8 to 1.1 percent. At 3, 6, and 9 weeks of age chicks showing slipped tendons and normal chicks were removed for bone analyses.

There was no significant difference between the size and mineral content of tibias from the chicks with slipped tendons and those from the normal chicks.

Inheritance of abnormal anatomical condition in the tibial metatarsal joints, P. J. Serfontein and L. F. Payne (*Poultry Sci., 13 (1934), No. 1, pp. 61–63*).—In this paper from the Kansas Experiment Station evidence is presented which indicates that the condition known as slipped tendons may be inherited. During the experiment two matings of Rhode Island Reds were made. One pen consisted of one male and eight females which had never shown signs of slipped tendons. The other pen was made up of one male and seven females, all of which had shown this abnormality in an advanced degree between 3 and 8 weeks of age. Chicks hatched from these matings were handled together.

In the straight-leg mating the incidence of slipped tendons among the chicks of both sexes was 18.6±2.6 percent, while for the crooked-leg mating it was 50±3.2 percent. On this basis it seemed highly probable that the tendency toward crooked legs was inherited. The results did not show whether there was any real difference in the expression of this abnormality in the two sexes.

Factors affecting the determination of the ash content of the tibiae of chicks, R. M. Bethke and P. R. Record (*Poultry Sci., 13 (1934), No. 1, pp. 29–33*).—In order to ascertain whether the method of examination or the solvent used was a factor determining variations in ash values, the Ohio Experiment Station crushed and extracted with hot 95 percent ethyl alcohol for 60 hr. the tibias from several lots of 6-week-old White Leghorn chicks that had been fed a rachitic ration supplemented with different amounts of vitamin D.

It was found that bones could be as effectively extracted with the above-described alcohol procedure as with alcohol followed by ether. Removing the proximal cartilage caused a significant increase in the ash percentage of the tibias. The moisture taken up by the extracted bone also significantly affected the ash percentage.

The advisability for standardizing the method of determining the ash, the procedure of preparing bones for ashing, and expressing the percentage of ash on a moisture-free and fat-free basis are discussed.

A "scurvy-like" disease in chicks, W. F. Holst and E. R. Halbrook (*Science, 77 (1933), No. 1997, p. 354*).—In this paper from the California Experiment Station the authors describe a scurvylike disease of baby chicks, the first symptoms of which appeared after about 3 weeks' feeding in battery brooders on a ration of fish meal, ground yellow corn, yeast, ground oyster shell, and sardine or cod-liver oil.

The symptoms were first nervousness and lameness, followed by bleeding from pin feathers on the neck, wings, or thighs. At about the same time blood clots appeared beneath the skin and in the muscles of the thigh, around the hock joint, and at the base of the wings. This was usually followed by frequent hemorrhages around the head, neck, back, ribs, breast, and keel, and in the abdomen and intestinal walls. Dark erosion spots were also found on the lining of the gizzard. Affected chicks often had brittle bones, the bone marrow was dry and colorless, and the blood showed an extremely low hemoglobin content.

Omitting the yeast caused the symptoms to be somewhat less severe, while substituting 10 percent of dried skim milk for the yeast and part of the fish

meal resulted in practically normal chicks. Cabbage fed at the rate of 5 g per bird to affected individuals during the fifth and sixth weeks brought about a complete recovery. From these results it was concluded that growing chicks may suffer from scurvy. The authors further believed that chicks are either unable to synthesize vitamin C or under certain conditions cannot synthesize the vitamin in amounts sufficient for their requirements.

DAIRY FARMING—DAIRYING

Proceedings of the 28th annual meeting of the American Dairy Science Association (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 587–595*).—A brief résumé of the meeting held at the University of Illinois from June 26 to 29, 1933, together with the titles of the papers presented in the various sections of the association (E. S. R., 69, p. 412).

[Experiments with dairy cattle and milk by the Ohio Station] (*Ohio Sta. Bul. 532 (1934), pp. 57–61, 62–66, 93, figs. 3*).—Brief results of experiments with dairy cattle are reported on feeding silage without hay for dairy cows, by C. C. Hayden, C. F. Monroe, A. E. Perkins, and L. E. Thatcher; feeding wheat to dairy cows, by Monroe and Hayden; Sudan grass pasture, by Monroe, Hayden, and Thatcher; extremes in protein feeding and lower protein standard for milk production, both by Perkins; menhaden fish meal for dairy cows, by Monroe, W. E. Krauss, and Hayden; soluble blood flour v. skim milk powder for calves, by Krauss, Monroe, and Hayden; the deficiencies of an exclusive milk ration for calves, by C. E. Knoop and Krauss; chemical and biological studies of bovine corpora lutea, by Krauss, Monroe, Hayden, and R. G. Washburn; a comparison of alfalfa and timothy meadows at the Trumbull County Experiment Farm; and Sudan grass for milk production at the Hamilton County Experiment Farm.

The studies with milk included data on seasonal variations in copper and iron content of milk, by Krauss and Washburn; the relative efficiency of irradiated ergosterol and irradiated yeast for the production of vitamin D milk, by Krauss and R. M. Bethke; a comparative study of the vitamin A content of butterfat from four breeds of dairy cattle, by T. S. Sutton and Krauss; and the vitamin A content of butterfat produced on corn or wheat rations, by Krauss and Monroe.

Feeding, care, and management of young dairy stock, J. B. Shepherd and F. W. Miller (*U.S. Dept. Agr., Farmers' Bul. 1723 (1934), pp. [2]+33, figs. 14*).—This supersedes Farmers' Bulletin 1336 (E.S.R., 49, p. 875) and Leaflets 14 (E.S.R., 58, p. 768) and 20 (E.S.R., 59, p. 167).

Some effects of different kinds of hay in the ration on the performance of dairy cows, E. B. Meigs and H. T. Converse (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 317–328*).—The U.S.D.A. Bureau of Dairy Industry has conducted experiments over a period of 10 yr., during which time cows have been kept continuously for long periods on rations of grain and hay without pasture. The general health, reproduction, milk production, and staying powers of cows were studied on rations in which the roughage consisted of various grades of alfalfa and timothy hay.

On rations containing liberal amounts of high quality alfalfa hay, cows maintained their health, milk production, and reproductive powers for periods up to more than 7 yr. When the roughage consisted of low quality timothy hay the milk production was decreased somewhat, general health and staying powers were less satisfactory, and reproduction was seriously interfered with. Difficulty was encountered in breeding cows so fed, and there was a marked tendency for them to throw premature calves that were either weak or dead

at birth. These abnormal calvings took place in spite of the fact that the cows were kept free from disease. Preliminary work indicated that better calving records were obtained with better quality timothy hay.

The feeding value of artificially dried young grass, III, O. M. CAMBURN (*Vermont Sta. Bul. 368 (1934), pp. 10*).—Continuing this study (E.S.R., 70, p. 81), artificially dried immature grass was soaked with 2.5 times its weight in water and compared with corn silage as a succulent feed. The soaked grass contained 5.9 percent crude protein, 5 percent crude fiber, 11.6 percent nitrogen-free extract, and 0.9 percent ether extract as compared with 1.9, 6, 13.8, and 0.5 percent, respectively, of these constituents for the corn silage.

The production of milk, fat, and solids-not-fat was slightly greater during a 12-week feeding trial with 10 dairy cows when soaked dried grass was fed, but the cows lost in weight. The animals consumed a somewhat greater amount of digestible nutrients when receiving soaked grass, but used slightly less nutrients per unit of milk, slightly more per unit of fat, and identical amounts per unit of total solids produced when compared with the silage-fed cattle. No significant difference was found in the nutrients required to produce a unit of 4 percent milk equivalent.

Value of koahaole (Leucaena glauca) as a feed for dairy cattle, L. A. HENKE (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 1 (1933), pp. 5*).—Results are given of the milk production of three cows pastured on one acre of volunteer koahaole with and without grain feeding. A high feeding value of this legume as a roughage was indicated, but an undesirable flavor was imparted to the milk.

Wet versus dry beet pulp for milk production, H. O. HENDERSON and C. E. TEAGUE (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 363–368*).—In three feeding trials lasting 10 weeks each the West Virginia Experiment Station compared the relative value of beet pulp when fed wet and when fed dry. The reversal method of feeding was used, and the cows had access to water from drinking cups at all times.

Under the conditions of this experiment, there was no appreciable difference in the feeding value of wet and dry pulp as to production of milk and butterfat, palatability, maintenance of body weight, or amount of water consumed. More labor was required to prepare and feed wet pulp than to feed dry pulp.

Pineapple bran v. beet pulp as supplements to grain rations fed to dairy cows, L. A. HENKE (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 3 (1933), pp. 8*).—Similar results were obtained as regards milk production on dry pineapple bran and wet beet pulp in tests with eight dairy cows by the double reversal method.

High protein ration to dairy cows, L. A. HENKE and G. W. H. GOO (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 2 (1933), pp. 8*).—The milk production on high and low protein rations was compared by the double reversal method and was found to be about equal on rations containing 10.8 and 20.2 percent of digestible crude protein.

Proportion of protein needed in the grain mixture fed with pasture, III, A. E. PERKINS (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 44–48*).—Continuing this series of studies (E.S.R., 61, p. 466), the high-protein mixture used was reduced to 20 percent instead of 33.3 percent high-protein products and had only 16 percent total protein instead of 20 percent as in the previous work. The low-protein ration also had a lower protein content (11 percent instead of 12 percent), due to the omission of bran. The range of protein content was thus reduced from 8 percent to 5 percent, which leveled off the price difference between the two mixtures.

In spite of the reduced differences and overlooking a small variation in live weight losses, the low-protein mixture was more economical in this study. On the basis of the results of this and previous work, it seemed safe to conclude that under ordinary pasture conditions the use of the high-protein mixture was not economical. Because of the benefits derived from the addition of some protein and some phosphorus to the low-protein ration, it seemed probable that both of these needs could be supplied by including from 5 to 10 percent each of bran and one of the oil meals in the summer grain mixture.

Effect of calcium-deficient roughages upon milk yield and bone strength in cattle, R. B. Becker, W. M. Neal, and A. L. Shealy (*Jour. Dairy Sci., 17 (1934), No. 1, pp. 1–10, fig. 1*).—The Florida Experiment Station found that over a period of years the typical rations fed to Jersey cows supplied an excess of protein, energy, and phosphorus, but were low in calcium content. Adding bone meal at the rate of 2 percent of the concentrates made the calcium level adequate for normal conditions. With this level of calcium 12 cows increased their milk production 4 lb. per day during subsequent lactations and were more persistent producers throughout longer lactation periods. The animals reached a stage of mineral storage where the leg bones of 9 had a breaking strength in excess of 3,000 lb. In the absence of the calcium supplement, several of the same cows had withdrawn mineral reserves to such an extent that a large proportion of them had suffered broken hips and ribs.

The effect of daily massive doses of viosterol upon calcium and phosphorus metabolism and blood calcium and inorganic phosphorus in calves, C. W. Duncan and C. F. Huffman (*Jour. Dairy Sci., 17 (1934), No. 2, pp. 83–91*).—At the Michigan Experiment Station a study was undertaken to determine the possible toxic symptoms and pathologic results produced by excessive doses of viosterol to calves on a normal and on a high calcium and phosphorus intake.

Large daily doses of viosterol decreased the total excretions of calcium and phosphorus by young calves. There was an increase in the absorption of calcium and phosphorus from the intestine. The excretion of calcium in the feces was decreased, while the excretion in the urine was greatly increased. Calcium concentration in the blood plasma due to viosterol feeding was not as markedly increased as was the inorganic phosphorus concentration. Blood calcium tended to decrease and phosphorus to increase some hours prior to death. Calves apparently showed an idiosyncrasy to the development of hypercalcemia in this study.

The effect of feeding a cod-liver oil concentrate to cows on the vitamin D content of milk, W. E. Krauss, R. M. Bethke, and W. Wilder (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 549–555*).—Continuing the work on increasing the vitamin D content of milk (E.S.R., 68, p. 663), the Ohio Experiment Station fed a cod-liver oil concentrate known commercially as Vitex. The same basal ration was fed to a group of six Holstein cows for 17.5 days. They were then divided into two groups of three animals each, and during the experimental periods the groups received at different times 6,000, 15,000, 40,000, and 60,000 rat units of Vitex. The vitamin D content of the milk was assayed with rats.

On the basal ration the milk contained less than 2.76 Steenbock rat units of vitamin D per quart. When 60,000 rat units of Vitex were fed, the milk contained 30.35 rat units per quart. On this basis the feeding of Vitex for increasing the vitamin D content of milk was not economical. The feeding of the 60,000 rat units of Vitex apparently had no effect on the physical condition or the production of the individual cows.

Pedigree analysis as a basis of selecting bull calves, L. Copeland (*Jour. Dairy Sci., 17 (1934), No. 2, pp. 93–102, figs. 2*).—The author tabulated and analyzed the performance of the ancestry of all the bulls listed by the American Jersey Cattle Club.[1] From this information an effort was made to explain why some bulls sire exceptionally high-producing daughters while others transmit only a low level of production.

The results showed that in analyzing the ancestry of a bull calf the records of the sire's daughters are of more importance than is the record of the dam alone. The evidence also shows that the records of the daughters of the maternal grandsire are more closely related to the production of the grandsons' daughters than are the records of the daughters of the paternal grandsire. A cow's production record, the record of her tested daughters, and the record of her sire's tested daughters give a good index of her germinal composition.

A sample pedigree is presented showing the points to be considered in selecting a bull calf.

Lactation in a barren heifer, I. Johansson and M. H. Knudson (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 523–528, fig. 1*).—The Wisconsin Experiment Station reports the case of a barren heifer which started to produce milk in response to sucking and milking and continued to do so for 630 days. There was a steady increase in the daily milk yield during the first 6 mo. of lactation, followed by a subsequent decline. The maximum daily production was 18.7 lb., and for the whole period 5,011.9 lb. of milk were produced. According to chemical analyses the milk was normal in all respects. A brief discussion is presented on the probable cause of the initiation and increase in milk production.

The yield and composition of milk from Aberdeen-Angus cows, L. J. Cole and I. Johansson (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 565–580, figs. 6*).—Based on the lifetime records of seven purebred Aberdeen-Angus cows, the Wisconsin Experiment Station presents evidence on the yield and composition of the milk of this breed. The butterfat percentage of the milk was tested once a week on composite samples taken at each milking. Chemical analyses of the milk of each cow were made once in every 4-week period during the early part of this study.

On the average the cows produced 3,100 lb. of milk with 4.1 percent of butterfat per lactation. There was a considerable range of variation around the average, especially in milk yield. The fat and protein content of the milk was a little lower than in the milk of two Jerseys kept under similar environmental conditions, but the ash and milk sugar percentage was practically the same. On the average the rate of milk secretion was lower and the lactation period shorter in Aberdeen-Angus than in Jersey and Holstein-Friesian cows.

A comparison of the leucocyte count, the brom thymol blue reaction, and the catalase content of freshly drawn milk, C. C. Prouty (*Jour. Dairy Sci., 17 (1934), No. 2, pp. 75–81*).—The object of this study at the Washington Experiment Station was to secure information on the leucocyte content of milk in relation to the pH value, to the catalase content, and to the presence or absence in the producing animal of pronounced positive evidence of mastitis over a period of several months. A comparative study was made of the bromothymol blue reaction, the catalase test, and the leucocyte content of 1,019 samples of freshly drawn milk from cows that had neither freshened recently nor were in advanced stages of lactation.

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[1] Tested Sires of the Jersey Breed. New York: Amer. Jersey Cattle Club, 1932, vol. 1, pp. 48.

Based on leucocyte content per cubic centimeter, the samples were grouped as follows: Less than 100,000, 100,000 to 250,000, 250,000 to 500,000, 500,000 to 750,000, 750,000 to 1,000,000, 1,000,000 to 2,000,000, and over 2,000,000. The following percentages of the various samples in the above respective groups reacted normally to the bromothymol blue test: 99, 94.9, 79, 48.4, 43, 17.3, and 18.7. The respective percentages of the samples reacting normally to the catalase test were 88.5, 66.5, 39.5, 31, 8, 3.9, and 3.1.

An average leucocyte count of 225,000 was obtained for 870 milk samples from 31 cows that were at all times free from positive evidence of mastitis. The average cell count of 850 samples reacting negatively to the bromothymol blue test was 208,000 per cubic centimeter as compared with 151,000 for 654 samples showing a catalase index of less than 1.5 cc. The average leucocyte count of 700 samples from 103 udder quarters that always gave a normal reaction to the bromothymol blue test was 160,000 per cubic centimeter. No excessive catalase content was found at any time in the 39 udder quarters of 19 cows, and the average cell count of 247 samples from these animals was 72,000 per cubic centimeter.

The results indicate that the percentage of animals producing milk normal to both the bromothymol blue and catalase tests from all quarters and at all times was low. In this work the average cell count of milk drawn from healthy normal udders was lower than that reported by other investigators.

The effect of increased blood glucose on milk sugar, C. H. Whitnah, W. H. Riddell, and R. E. Hodgson (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 347–353, fig. 1*).—Continuing this study (E.S.R., 67, p. 448) at the Kansas Experiment Station, provisions were made for detecting the presence of unconverted glucose in the blood of lactating cows. The rise in blood sugar was produced experimentally by pumping glucose solution into the stomachs of milking cows.

Milk drawn at the time of maximum increase of blood sugar had a higher lactose concentration than corresponding milkings on the preceding and following days. The increase was followed by a decrease to a subnormal value. The increase in lactose was not proportional to the increase in blood sugar. The average amount of fermentable sugar in milk calculated as glucose showed a significant increase for approximately 24 hr. after the rise in blood sugar. The concentration of blood glucose was not a primary factor controlling lactose concentration.

Milk color and fat related, J. W. Bartlett (*N.J. Agr., 16 (1934), No. 2, p. 4*).—A relationship was observed between yellow color and fat content of milk.

Studies on the iodine content of milk, I, II (*Jour. Dairy Sci., 17 (1934), No. 1, pp. 15–28, figs. 2*).—A series of experiments was undertaken to determine whether iodine, either that existing as a normal constituent in milk or that which might be subsequently added, was retained after milk was subjected to certain common procedures.

I. *Effect of desiccation and storage,* Z. M. Hanford, G. C. Supplee, and R. E. Remington.—In this phase of the study it was found that the iodine content of milk dried by the atmospheric double roller process was not less than that of milk slowly evaporated to dryness at 60° to 80° C. after the addition of sodium hydroxide. When elemental iodine was added to both milks previous to drying an average recovery of approximately 83 percent was obtained. Changes in acidity within a range suitable for drying milk by the roller process did not affect the recovery of the added iodine. Storage for as long as 7 mo. resulted in no apparent loss of iodine from dry milk.

II. *Variations in the mixed milk of herds,* R. E. Remington, and G. C. Supplee.—In this part of the work samples of mixed milk from eight different

parts of South Carolina originating in herds that received only locally grown feeds and no iodized salt were collected at 3-week intervals over a period of 10 mo.

For 117 samples the average iodine content was 572±16 parts per billion, dry basis. The averages for samples originating at two points in the Coastal Plain were significantly lower than for six points in the Piedmont Region. The values obtained in April and May were slightly but significantly lower than for the remainder of the period. During the same period nine samples of milk from a commercial milk-drying plant in New York and six samples from one in Wisconsin averaged 265±24 and 322±22 parts per billion, respectively, and the seasonal variations were greater than in the South Carolina samples.

A simple method for production of vitamin D milk of known and controllable potency, D. H. Shelling and H. C. Tidwell (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, pp. 605, 606*).—The new method for introducing vitamin D into milk described consists simply in homogenizing in water a concentrated oily solution of viosterol of known potency, with lecithin as an emulsifying agent.

"This stable emulsion appears white as milk, is miscible with it, and has no objectionable odor or taste. It may be kept in the ice box under ordinary conditions. It could be aerated with nitrogen, sealed in vials, and shipped for distribution. Since each cubic centimeter of the emulsion is of known antirachitic potency, a given amount of the emulsion may be thus added to a measured amount of milk so as to impart to it a desired number of international or rat units per quart. The emulsion may be added to the milk before pasteurization, as this procedure does not impair the vitamin D potency."

The emulsion is also said to retain its vitamin D potency after standing for several months or after heating for 15 min. at 100° C.

"We believe that this method of fortifying milk with vitamin D is the most practical, since it is the simplest and is controllable and offers a universal means of supplying vitamin D to those who are in need of it and would not otherwise receive it. It ought to be much less expensive than the other methods. Its cost will depend on the price of viosterol as determined by the Wisconsin Foundation."

A study of the effect of removing foremilk on the fat content of the remainder of the milking, H. E. Ross and H. Winther (*[New York] Cornell Sta. Bul. 589 (1934), pp. 7*).—The effect of removing foremilk on the fat percentage of the subsequent milk was tested by removing 5, 10, 15, or 20 streams of milk from 45 different animals in six breeds in different stages of lactation.

The results showed that the fat percentage of the foremilk was below that of the remainder of the milk. By removing 20 streams of the foremilk the fat percentage of the subsequent milk was raised in most cases less than 0.2 percent, although as much as 10 percent of the milk was removed.

The determination of the bitter substance in "bitterweed" milk, N. D. Weathers (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 401–403*).—The Tennessee Experiment Station undertook a study to develop a qualitative test and a quantitative procedure for determining the bitterweed principle.

It was found that the bitter substance imparted to milk by bitterweed (*Helenium tenuifolium*) could be detected by the characteristic orange red color developed when contaminated milk was treated directly with solutions of picric acid and sodium hydroxide. Quantitative determination could be accurately made on the alcohol-ether extracts of centrifuged milk by the use of standards of purified bitter crystals or by the use of either creatinine or picramic acid standards.

The Escherichia-Aerobacter group of bacteria in dairy products, M. W. Yale (*Jour. Dairy Sci., 16 (1933), No. 5, pp. 481–494*).—At the Iowa Experiment Station 204 cultures belonging to the *Escherichia-Aerobacter* group of bacteria were isolated from 212 samples of dairy products and identified on a species basis. Of these cultures 91 were isolated from 70 samples of raw milk, 21 from 64 samples of pasteurized milk, 42 from 24 samples of raw cream, 16 from 20 samples of ice cream, 9 from 9 samples of ropy milk and cream, and 25 from 25 samples of defective butter.

The genus *Escherichia* made up 63 percent of the cultures from raw milk, 57 from pasteurized milk, 33 from raw cream, and 31 percent from ice cream. The cultures of the genus *Aerobacter* from the above groups were 26, 10, 57, and 56 percent, respectively, and in addition 100 percent from ropy milk and cream and 88 percent from defective butter. The intermediate group made up 11 percent of the cultures from raw milk, 33 from pasteurized milk, 10 from raw cream, 13 from ice cream, and 12 percent from defective butter.

The following species of *Escherichia* were isolated and identified: *E. coli, E. pseudocoloides, E. communior, E. paragrünthali, E. vesiculiformans, E. formica, E. enterica, E. anaerogenes, E. grünthali,* and *E. neapolitana.* In the genus *Aerobacter* the following species were isolated and identified: *A. aerogenes, A. cloacae,* and *A. oxytocum.* Of all these species the most common were *E. coli* in raw milk, *E. pseudocoloides* in pasteurized milk, *A. cloacae* in ice cream, and *A. aerogenes* in raw cream, ropy milk and cream, and defective butter.

According to the classification used, 80 of the 204 cultures could not be identified. Of these cultures, 26 belonged to an intermediate group and the remainder were classified as atypical cultures of various species.

Further studies on the effect of pasteurization on the bacterial flora of low count milk, C. C. Prouty (*Jour. Dairy Sci., 17 (1934), No. 2, pp. 115–120*).—The Washington Experiment Station made total and differential bacterial counts (E.S.R., 68, p. 88) on 75 samples each of raw and commercially pasteurized milk while fresh and again after 24 and 48 hr. of incubation at 70° F.

Pasteurization was found to decrease the percentage of acid-forming bacteria from 29.4 to 18.8 and the percentage of the proteolytic group from 7 to 5, and to increase the alkali-forming and inert group from 63.6 to 76.2 percent. After 24 hr. the acid-forming bacteria in raw and pasteurized milk constituted 92.1 and 12.4 percent, respectively. There was no significant difference in the proportion of the proteolytic group in the two kinds of milk. The alkali-forming and inert group made up 7.4 percent of the flora of raw milk and 86.4 percent of pasteurized milk. At this time the flavor of pasteurized samples was more desirable than that of raw samples. After 48 hr. raw milk showed 98.7 percent acid coagulants as compared with 57.3 percent for pasteurized samples. Acid-forming organisms made up 96 percent of the flora of raw milk and 76.1 percent of the flora of pasteurized milk. Less than 1 percent of the flora of either milk was of the proteolytic group. Alkali-forming and inert bacteria made up 4 and 23.7 percent of the flora of raw and pasteurized milk, respectively. Of the pasteurized samples 20 percent developed a pronounced bitter flaver without accumulating more than 0.4 percent acid.

These results showed that organisms other than the lactic acid types were generally responsible for the spoilage of commercially pasteurized milk produced from low-count raw milk.

Studies on whipping cream, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 329–345, figs. 9*).—The Wisconsin Experiment

Station made a study of some of the factors concerned in the production of high quality whipping cream and of the properties of whipped cream.

Creams containing from 30 to 34 percent of butterfat were found most satisfactory for whipping. Such cream should be aged for 24 hr. at a temperature of 40° F. or lower, while richer creams could be aged at higher temperatures with less danger of loss in whipping quality. The reaction of the cream as affected by aging was not so important as other changes that occur in cream during this period. The addition of sodium citrate corrected the poor whipping quality occurring in cream in the early spring. From 0.1 to 0.4 percent of sodium citrate could be added to cream containing less than 34 percent of butterfat without deleterious effects upon the cream, and it also decreased the whipping time. Such cream when whipped retained its shape when turned out in molds somewhat better than untreated cream. Sodium citrate gave more satisfactory results in decreasing the whipping time, improving the body, and in not altering the flavor as compared with calcium lactate, calcium acetate, disodium phosphate, and potassium citrate.

A note on the surface tension of homogenized cream, B. H. Webb (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 369–373, fig. 1*).—The U.S.D.A. Bureau of Dairy Industry made a study of the surface tension of creams of varying fat percentages that had been homogenized at different pressures. The surface tension measurements were made at 25° C. with a du Noüy apparatus which measured the force necessary to pull a platinum ring of a radius=0.6366 cm from the surface of the liquid.

It was found that homogenization increased the surface tension of cream. As the homogenizing pressure and fat content of the cream were increased there was a corresponding increase in surface tension. Because of the difficulties encountered in obtaining consistent static, surface tension values for colloidal protein solutions such as milk or cream, the author suggests that a reliable method of measuring dynamic surface tension would reflect more accurately the true surface tension.

Substances adsorbed on the fat globules in cream and their relation to churning.—III, Analysis of the adsorbed protein, H. F. Wiese and L. S. Palmer (*Jour. Dairy Sci., 17 (1934), No. 1, pp. 29–32*).—Continuing this study at the Minnesota Experiment Station (E.S.R., 69, p. 853), the results of the analyses for nitrogen distribution are presented in tabular form. The chemical differences of the various protein fractions are discussed.

The linoleic and linolenic acid contents of butter fat, H. C. Eckstein (*Jour. Biol. Chem., 103 (1933), No. 1, pp. 135–140*).—In this paper the author reports the results of an analysis of the linoleic and linolenic acid contents of samples of butterfat representative of the butter produced in the State of Michigan. The contents were calculated from the weights of the crystalline bromide fraction.

The linoleic acid content ranged from 0.17 to 0.25 percent, while the linolenic acid content varied from 0.07 to 0.17 percent. It is pointed out that these values are probably too low, since a study of the methods used for determining them showed that when they were added to butter poor recoveries were obtained. The linolenic acid content of butterfat could be increased by adding linseed meal to the ration.

Maintaining the vitamin A value of butter through winter feeding conditions, J. H. Hilton, S. M. Hauge, and J. W. Wilbur (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 355–361*).—Experiments were conducted at the Indiana Experiment Station to determine the relative efficiency of various feeds for maintaining the high vitamin A value of summer-produced butter.

Under winter feeding conditions timothy hay produced a low value vitamin A butter, while good quality alfalfa or soybean hay were both effective in maintaining either the high vitamin A level of butter or in restoring its summer value. The evidence indicated that the vitamin A value of butter responded rapidly to changes in the ingestion of vitamin A by the cows.

Studies on the butter culture organisms in butter, J. A. Nelson and B. W. Hammer (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 375–385, fig. 1*).—Butter was made and examined at the Iowa Experiment Station after varying holding periods at a temperature favorable for the growth of butter culture types. Some churnings were made on a laboratory scale and others on a commercial scale, both involving the use of skim milk cultures of *Streptococcus lactis*, *S. citrovorus*, or *S. paracitrovorus* and butter cultures. Salted and unsalted butter from each churning were studied.

In general, it was found that in salted butter held at a favorable growth temperature the butter culture streptococci developed little if at all. One citric acid fermenting streptococcus showed some development, but distinctly less than in unsalted butter. The organisms other than streptococci sometimes did and at other times did not show any growth. With unsalted butter at the favorable growth temperature the butter cultures developed extensively, as shown by both plate and microscopic counts. Long chains of streptococci in the butter gave the most striking evidence of growth. The other organisms also made extensive growth. In butter held at 21° C., the microscopic count was often less after 1 week than at some previous time. A rather large decrease in microscopic count commonly occurred after an extended holding period at −20°.

The detection of the Escherichia-Aerobacter group in butter, M. Grimes (*Jour. Dairy Sci., 17 (1934), No. 1, pp. 11–13*).—In this paper from University College, Cork, the author describes the methods used in the routine analyses of butter. This work has shown that litmus milk was a better enrichment medium than nutrient lactose broth for the detection of the *Escherichia-Aerobacter* group in butter.

A study of the relationships between hydrogen ion concentration, titratable acidity, and quality in Cheddar cheese, L. W. Brown and W. V. Price (*Jour. Dairy Sci., 17 (1934), No. 1, pp. 33–45, figs. 4*).—At the Wisconsin Experiment Station, the titratable acidity and pH concentration were studied during the making of Cheddar cheese in their relation to the quality of the cheese. A total of 54 paired lots of cheese were made from identical milk. One lot was made in a normal way, while the second was manufactured in some way to produce a sour cheese. The cheeses were cured at a temperature of about 45° F.

Electrometric measurements of the pH concentration in the whey during the manufacturing process apparently did not indicate significant changes in acidity any more accurately than did the ordinary titration test. During the ripening process, however, these measurements can be easily duplicated and although not necessarily indicative of the quality of the cheese they may be used to indicate its suitability for a specific purpose such as processing. It was found that the pH concentration and titratable acidity were high at each critical point during the manufacturing process when the quality of the cheese was inferior.

The growth of Penicillium roqueforti on synthetic media, N. S. Golding (*Jour. Dairy Sci., 17 (1934), No. 2, pp. 61–74, fig. 1*).—An investigation was undertaken at the Washington Experiment Station to obtain a strong enzyme extract to produce a Roquefort flavor in processed cheese subsequent to heating. Methods for obtaining a heavy mold growth on synthetic media were investigated.

An especially heavy growth of *P. roqueforti* was obtained by using a modified Dox (E.S.R., 22, p. 703) salt solution and increasing the proportion of casein and dextrose. When 5 percent casein and 20 percent dextrose were used, maximum felts were obtained. The pH during growth ranged from 2.05 to 7.7, depending upon the proportion of dextrose and casein. While the dextrose was present in the medium an acid reaction was obtained, but as soon as the dextrose was used up by the mold the reaction moved toward the alkaline side. A preliminary study of the protein break-down of the casein in the media under widely different pH concentrations did not show any material change in the general type of break-down due to the growth of *P. roqueforti* for the growth periods studied.

Thermophilic streptococci as starters for Swiss cheese, W. C. Frazier, L. A. Burkey, K. J. Matheson, and P. D. Watson (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 387–399, figs. 3*).—The U.S.D.A. Bureau of Dairy Industry made over 350 pairs of Swiss cheese in the laboratory at Washington and at a Pennsylvania and an Ohio factory to compare cheese made with *Lactobacillus casei* culture alone with cheese made with both *L. casei* and *Streptococcus thermophilus*.

Under most conditions the quality of cheese was improved by the use of starter containing *S. thermophilus*. The improvement was most marked in eye formation, texture, and flavor. Many of the cheeses made with such starters had a tendency toward checking and glass. Cheese made with "raw" or kettle whey starter was not superior to cheese made with pure cultures of *S. thermophilus*. The use of pure cultures took away the uncertainty inherent in the use of raw whey starters. Various strains of *S. thermophilus* isolated from Swiss cheese whey acted differently when used as starters.

The manufacture of low-lactose skim milk for use in ice cream, B. H. Webb and O. E. Williams (*Jour. Dairy Sci., 17 (1934), No. 2, pp. 103–114*).—This experiment was undertaken by the U.S.D.A. Bureau of Dairy Industry to perfect a method for removing a large percentage of the lactose from skim milk without changing the normal dispersion of its proteins.

The following process, both in the laboratory and under semicommercial conditions, removed approximately 65 percent of the lactose without altering the dispersion of the milk proteins: Adding 5.9 lb. of cane sugar to 100 lb. of fresh skim milk, forewarming the mixture to 63° C. for 10 min., evaporating under vacuum to 70 percent total solids, drawing and cooling to 25°, holding for 20 hr. at 10°, and removing the crystallized lactose by means of a centrifuge or a filter press.

This low-lactose milk could be used for increasing the milk-solids-not-fat of an ice cream mix above that amount where lactose crystallization may develop when normal milk solids are used to reach an identical concentration. Ice cream mixes containing from 11 to 13 percent milk-solids-not-fat, in which the concentration of lactose was controlled by the use of low-lactose milk, had an improved body and texture and could withstand adverse handling conditions without developing sandiness.

A study of factors related to the hardening of ice cream, P. H. Tracy and C. Y. McCown (*Jour. Dairy Sci., 17 (1934), No. 1, pp. 47–60, figs. 9*).—An investigation at the Illinois Experiment Station was planned to determine the relation of certain factors to the speed with which heat is removed from ice cream in a commercial type of hardening room. Temperature changes occurring during hardening were determined by means of thermocouples accurate within 0.1° F.

It was found that in still air the temperature of the center portion of a 5-gal. can of ice cream remained constant for approximately 5 hr. After this period the temperature fell rather rapidly, reaching 0° after about 13 hr. in a −18° hardening room. A difference of 2.5° in drawing temperature resulted in a saving of approximately 16 percent in the time required to reach 0°. Variations in overrun resulted in differences in drawing temperatures and the amount of water per unit volume to be frozen. As the freezing point of the mix was raised, the rate of hardening was increased. This was particularly true between 22° and 0°.

The use of an electric fan in the hardening room increased the rate of hardening of the ice cream about 100 percent. This was thought to be due to the effect of the convection currents sweeping away the air film surrounding the container. Painting the outside of ice cream cans black reduced the hardening time in still air about 15 percent, due to the greater heat radiation from the darkened surface. By hardening in the presence of forced convection currents the amount of heat transferred by radiation was greatly reduced, due to the shorter hardening period and the lower temperature at the surface of the container. Hardening time depended upon the area and shape of the package, and paraffining paper packages did not decrease the rate of hardening. Paper liners increased the hardening time of 5-gal. cans less than 2 percent. Hardening was faster in paper cans than in steel cans, while fiber cans conducted the heat from the ice cream more rapidly than did either paper or steel cans. Painting fiber cans black did not alter the rate of heat transfer.

Factors contributing to an off-flavor in ice cream, C. D. Dahle and E. C. Folkers (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 529–547, fig. 1*).—The Pennsylvania Experiment Station continued this investigation (E.S.R., 69, p. 707) to determine the underlying causes for the prevailing off flavor in strawberry ice cream and to offer a solution of the defect if possible. Various types of berries, berries treated in different ways, the effect of quality and source of dairy products used, and the effect of copper contamination were studied. Several other factors such as the amount of flavoring used, the acidity, and neutralization were also given attention. Considerable work was done to see if the defect was due to decomposition of the fat.

The off flavor could be produced with fresh, cold-packed, and canned strawberries. Increasing the quantity of berries from 10 to 20 percent of the mix delayed the occurrence of off flavor. The flavor may develop as readily in pineapple as in strawberry ice cream. Heating the mix and berries to 180° F. for 1 hr. did not prevent the off flavor from appearing. Neutralizing the acidity of the berries to pH 7 delayed the appearance of this flavor but injured the natural strawberry flavor. The quality of the milk products used, "cardboard" flavored cream, and skim milk in the mix had little effect on flavor. The absence of cream from the mix did not prevent the off flavor when certain condensed milks were used, and condensed milks containing enough copper to make the total amount of copper in the mix equal to 1.3 p.p.m. caused the off flavor to develop. Three types of dried skim milk used instead of condensed milk did not add sufficient copper to cause the flavor. The most important source of copper in the milk products was the copper vacuum pan used in concentrating. When such pans were used daily and kept well polished, they were not a serious source of contamination.

A modification of the method for the direct microscopic examination of ice cream and other dairy products, A. C. Fay (*Jour. Dairy Sci., 16 (1933), No. 4, pp. 311–313*).—In this paper from the Kansas Experiment Station the author suggests a modified procedure for the direct microscopic examina-

tion of ice cream and other dairy products. The following advantages are given for the method: (1) It eliminates the use of special capillary pipettes, (2) obviates the necessity of tedious weighing of a 0.01-g sample, (3) guide plates are unnecessary, (4) the thin smear reduces the difficulties met in examining samples high in fat, (5) where relatively few organisms are present, one or more strips across the slide may be examined without keeping track of the number of fields observed, and (6) while especially adapted to the examination of dairy products high in fat, it is also applicable to the examination of milk and condensed milk.

Microbiology of frozen foods.—VI, The survival of pathogenic microorganisms in ice cream, G. I. WALLACE and R. CROUCH (*Jour. Dairy Sci.*, *16* (*1933*), *No. 4*, *pp. 315, 316*).—In this study the authors found that *Salmonella enteritidis*, *S. aertrycke*, *Brucella abortus* Bang, *B. abortus* porcine, *B. melitensis*, *Mycobacterium tuberculosis hominis*, *M. tuberculosis bovis*, and *M. bacterium avium* survived freezing in ice cream for periods longer than 30 mo. While the artificially inoculated ice cream used in the work contained more bacteria than is commonly encountered in ice cream made from naturally infected milk, the results suggest that ice cream should not be considered a safe food simply because it is frozen.

VETERINARY MEDICINE

[Report of work with diseases and parasites of livestock by the Ohio Station] (*Ohio Sta. Bul. 532* (*1934*), *pp. 61, 68, 69, 71, 75, 76*).—The work of the year briefly referred to (E.S.R., 69, p. 104) includes that with mastitis, by C. F. Monroe and R. C. Thomas; swine erysipelas, by [A. F.] Schalk and B. H. Edgington: *Brucella abortus* infection in cattle and fowl pox immunization, both by Edgington; and bacteria as food for the larvae of *Oesophagostomum columbianum*, by R. E. Rebrassier; and anthelmintics for poultry.

Animal parasites and parasitic diseases (*Puerto Rico Sta. Rpt. 1933*, *pp. 19-22*).—The work of the year (E.S.R., 69, p. 105) is briefly dealt with under the headings of reducing parasitic infection, similarity of parasites in Puerto Rico and St. Croix, internal parasites of horses, colics in horses caused by worms, anaplasmosis and piroplasmosis in cattle, and cysticercosis or "pepita" of swine.

Azamine in infectious diseases in large and small animals, C. E. DE CAMP (*North Amer. Vet.*, *14* (*1933*), *No. 10*, *pp. 26-30, 31*).—A discussion of the bactericidal action of azamine, which is an azo dye of the pyridine series chemically designated as tolyl-azo-diamino-pyridine-hydrochloride. It is an aniline dye. Azamine exhibits the following physiological properties: "(1) Powerfully bactericidal to most pathogenic cocci, members of the *B*[*acillus*] *coli* group, and necrosis producing organisms; (2) deeply penetrative of all epithelial tissues; (3) in therapeutic doses it is nontoxic and nonirritating; [and] (4) it is eliminated through the urinary tract with no cumulative effect."

Bang's disease in Canada, R. GWATKIN (*North Amer. Vet.*, *14* (*1933*), *No. 11*, *pp. 32-36*).—This discussion is presented in connection with a list of nine references to the literature. The results of testing and control work in various districts during a three-year period ended in 1932 are presented.

Results of some recent investigations on hemorrhagic septicemia, J. P. SCOTT (*North Amer. Vet.*, *14* (*1933*), *No. 10*, *pp. 21-25, 26*).—Contributing from the Kansas Experiment Station, the author suggests that there are two disease conditions which are frequently called hemorrhagic septicemia. "First, spontaneous hemorrhagic septicemia, a sporadic and endemic disease having

a rapid course and high mortality which is characterized by pneumonia, acute hemorrhagic gastroenteritis, and subcutaneous swellings; second, shipping fever or exposure disease having a slow onset of one to several days, a course extending in some cases to several weeks and which on autopsy is characterized chiefly by fibrinous pleuropneumonia and catarrhal enteritis.

"Field and experimental studies show that vaccination of cattle and experimental animals does not produce a satisfactory immunity. In field investigations it was found that when vaccination is practiced during shipment or after arrival at the farm losses are twice to three times as high among vaccinated animals as among untreated animals. Infection experiments show that calves which are fed on reduced diets are less susceptible to infections of *Pasteurella boviseptica* than are animals on full feed. Studies of the housing and care of animals in the field show that proper care and housing of recently shipped in animals will reduce losses to a minimum.

"The study of a small number of animals given antihemorrhagic septicemia serum suggests that this product may be of some value in the treatment of shipping fever. It is shown that hemorrhagic septicemia bacterin and aggressin produce a negative phase during which the animal is more susceptible to the rigors of exposure. The protection of poultry against fowl cholera is only relative, and chickens injected with repeated doses of fowl cholera bacterins may be less resistant than untreated controls."

Rocky Mountain spotted fever: The susceptibility of mice, W. L. JELLISON (*Pub. Health Rpts.* [*U.S.*], *49* (*1934*), *No. 11, pp. 363–367*).—The author has found meadow mice (*Microtus pennsylvanicus modestus*) to be highly susceptible to Rocky Mountain spotted fever. "Laboratory infection in them differed from that observed in most other native rodents in that fatalities and scrotal involvement were frequent. The virus was maintained in meadow mice without apparent loss of virulence through four consecutive transfers over a period of 28 days. Infected nymphal ticks transmitted the virus to meadow mice, from which noninfected larvae acquired the infection, thus demonstrating tick-to-tick transfer of the virus through this rodent as a medium.

"Deer mice [*Peromyscus maniculatus artemisiae*] were also found definitely susceptible, but evidently in less degree than meadow mice. No fatalities occurred among the virus-injected deer mice, and characteristic gross lesions were lacking in those that were sacrificed for passage material.

"House mice [*Mus musculus*] were distinctly resistant to the virus, and it was not possible to recover the infection from them 7 to 11 days after injection.

"It appears probable that meadow mice and deer mice are natural avenues for the transfer of spotted fever virus from infected to noninfected ticks. In some regions, at least, it is possible that they (particularly species of *Microtus*) may be factors of importance in the natural maintenance and spread of the virus. This is most likely in parts of the United States in which D[*ermacentor*] *variabilis* is prevalent, since mice are apparently far more important hosts of the larval and nymphal stages of this tick than of those of *D. andersoni*."

Paragonimus, its life history and distribution in North America and its taxonomy (Trematoda: Troglotrematidae), D. J. AMEEL (*Amer. Jour. Hyg.*, *19* (*1934*), *No. 2, pp. 279–317, pls. 6*).—This is a report of studies of *Paragonimus* sp. (probably *kellicotti*), the lung fluke of mammals, which has long been recognized as one of the most important parasites of man in Asia, especially in Japan, Chosen (Korea), and Taiwan (Formosa), although reported but a few times as a human parasite in America.

All stages of its life history have been worked out, the mink being the usual mammal host. "The second intermediate host is various species of crawfishes of the genus *Cambarus*. The snail host is *Pomatiopsis lapidaria*. All four generations in the snail have been reared in experimentally infected snails. The sporocyst and first generation redia of *Paragonimus* have been described in detail for the first time. The two redial generations have been distinguished on a structural basis. Hitherto undescribed morphological structures are reported for the miracidium, first and second generation rediae, unemerged cercaria, emerged cercaria, and metacercaria.

"The knowledge concerning the distribution of the lung fluke of mammals in North America has been considerably enlarged. Sufficient evidence has been presented to indicate that the cuticular spines of the adult may not be good criteria for species differentiation. It has been suggested that characters more suitable for this purpose may be found in the life history stages but that, to be of value, it would be necessary to work out the life history in many endemic areas. The size of the gut in the second generation redia was pointed out as the one difference between the lung flukes of North America and Asia."

A list is given of 42 references to the literature.

The viability of tapeworms in artificial media, R. A. Wardle (*Physiol. Zool., 7 (1934), No. 1, pp. 36–61, figs. 2*).—This account is presented in connection with a list of 41 references to the literature.

Experimental diagnosis of bovine infectious abortion by allergic reactions [trans. title], C. Dubois and C. Brune (*Compt. Rend. Soc. Biol. [Paris], 112 (1933), No. 13, pp. 1297–1300*).—The authors find the intradermal test, in which an emulsion of killed *Brucella abortus* is used, to be a reliable means for detecting herd infection. Studies aimed at the determination of the value of the test in the diagnosis of carriers are under way.

The intradermal reaction in the diagnosis of bovine infectious abortion [trans. title], P. Rossi and F. Vigel (*Compt. Rend. Soc. Biol. [Paris], 115 (1934), No. 3, pp. 248–250*).—The authors confirm the work of Dubois and Brune, having found the intradermal test to detect the disease in bovines naturally or experimentally infected by *Brucella abortus* or *B. melitensis*. The method appears to be more sensitive than the agglutination test and detects infection in the carrier. The intensity of the reaction is not directly related to the agglutination titer nor to the time elapsed since an abortion.

The intradermal reaction and bovine infectious abortion [trans. title], P. Rossi and F. Vigel (*Compt. Rend. Soc. Biol. [Paris], 115 (1934), No. 3, pp. 250–253*).—In continuing the studies above noted, the authors found that the intradermal test of Dubois and Brune detected *B. abortus* infection in 2 young animals 10 days after an experimental inoculation of 5 cc of a live culture. The test did not affect milk secretion in any way.

Eradication of Bang's disease in a herd of beef cattle, C. C. Palmer (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 802–805, fig. 1*).—In work by the Delaware Experiment Station, infectious abortion was controlled and eradicated by agglutination testing and removal of the positive animals in a herd of Hereford cattle in which 75 percent of the breeding stock was found infected. "Blood testing and removal of the reactors proved entirely satisfactory and practical in the eradication of Bang's disease in this herd. The herd has remained free of all evidence of Bang's disease for a period of three years. The use of a properly constructed crate facilitates the collection of blood samples in beef cattle."

Oxidation-reduction studies of growth and differentiation of species of Brucella, C. D. Tuttle and I. F. Huddleson (*Jour. Infect. Diseases, 54* (*1934*), *No. 2, pp. 259–272, figs. 9*).—In work at the Michigan Experiment Station it was found that "electrodes made of graphite (Acheson special) are suitable for measuring the oxidation-reduction reactions of aerobic bacteria in liquid mediums under aerobic conditions. The reduction potentials of *Brucella* in beef liver infusion broth under aerobic conditions show a negative drift that attains the E_h value ±0.15 to+0.09 v at the end of an incubation period of eight days. *B. suis* shows a slightly more negative drift than the other two species. *B. abortus* in the presence of thionine [and] *B. suis* in the presence of basic fuchsin [are] unable to reduce the potential of the medium. Neither thionine nor basic fuchsin retards the negative drift of the potential of the medium caused by the growth of *B. melitensis*."

Determination of oxidation-reduction potentials of sterile culture mediums with the graphite electrode, C. D. Tuttle and I. F. Huddleson (*Jour. Infect. Diseases, 54* (*1934*), *No. 2, pp. 273–279*).—In continuation of work at the Michigan Experiment Station, above noted, the authors found that "an electrode made of special Acheson graphite is satisfactory for oxidation-reduction studies of liquid mediums used in growing bacteria. The electrode is stable enough in a liquid medium to permit the use of a potentiometer. Graphite electrodes when treated as described can be made to agree with each other within 35 mv. The oxidation-reduction potential of graphite electrodes is not affected by small changes in the pH of the medium."

The use of various agents in an attempt to influence the Brucella agglutinin content of the blood, C. H. Kitselman (*Jour. Amer. Vet. Med. Assoc., 84* (*1934*), *No. 4, pp. 603–608*).—In work at the Kansas Experiment Station intravenous injections of formalin, acriflavine, proflavine, metaphen, guaiacol, and azamine were not followed by any observable beneficial effects in *Brucella*-infected animals. "Prostration and a high thermal response followed each intravenous injection of massive doses of *Brucella* bacterin in *Brucella*-infected cows. The peak of the thermal response was reached 10 hr. after the injection, and from 2.5 to 4 days elapsed before the temperature dropped to normal. No *Brucella* agglutinins were demonstrated in the blood of heifers following injections with hemorrhagic septicemia bacterin. These animals became reactors to a hemorrhagic septicemia antigen. No interagglutinability was demonstrated for a *Brucella* antigen following injections with hemorrhagic septicemia bacterin."

Passage of bovine Brucella through swine, H. L. Gilman, C. H. Milks, and R. R. Birch (*Jour. Infect. Diseases, 54* (*1934*), *No. 2, pp. 171–174*).—This is a report of an attempt to ascertain whether passage of bovine strains of *Brucella* through a series of sows would induce these strains to assume the characteristics of the porcine type, as determined by the dye tolerance tests. In the course of the work 1 strain was passed through a series of 2 hogs, 2 strains were passed through 2 series of 5 hogs each, and 1 strain through a series of 6 hogs. At no time were the authors able to detect any change from the bovine to the porcine type, as determined by the reaction of the strains to the presence of basic fuchsin or thionine in the mediums in dilutions of 1 : 50,000.

Studies on the leucocyte content of milk drawn from Brucella abortus infected udders, C. C. Prouty (*Jour. Bact., 27* (*1934*), *No. 3, pp. 293–301*).—This contribution from the Washington Experiment Station reports upon a study made of the leucocyte content of the milk from 18 abortion-infected cows in relation to the presence of *B. abortus* within the udder.

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"Thirteen cows were found by cultural methods to harbor *B. abortus* in one or more quarters of the udder. Two were found to be infected in all quarters and 7 in only one quarter. Twenty-one of the 72 quarters were found to be infected.

"The average leucocyte count per cubic centimeter of milk from the 21 infected quarters was 355,000, as compared to 343,000 for milk from the 51 quarters that gave negative cultural findings. Two of the *B. abortus* infected quarters and 2 of the noninfected quarters produced milk of a high leucocyte count due to the presence of active streptococcic mastitis. When the samples of milk coming from these quarters were omitted in computing averages, average cell counts of 145,000 and 185,000 per cubic centimeter were obtained for the samples from the *B. abortus* infected and noninfected quarters, respectively. Similar average leucocyte counts were obtained for samples of milk from animals in an abortion-free herd. All samples of milk giving negative agglutination reactions in amounts of milk serum less than 0.08 cc gave negative cultural findings for *B. abortus*.

"The results of the present study showed no significant differences in the leucocyte count of milk from *B. abortus* infected udders and of milk from animals free from this disease."

Brucella abortus infection in cattle in relation to milk, R. GWATKIN (*Canad. Pub. Health Jour., 25 (1934), No. 1, pp. 5–9*).—The author reports having recovered *B. abortus* from the milk of a cow the blood serum of which gave a negative agglutination test. "It appeared to be a vaccinal strain. *B. abortus* was also isolated from guinea pigs which gave negative agglutination and complement fixation tests. *B. abortus* was isolated from the placentae of 3 out of 10 cows, the sera of which gave suspicious (1 : 50) agglutination tests. One had aborted and the agglutinin titer never exceeded 1 : 50. One had previously given a positive reaction, and the other became positive shortly afterward. The organism was not recovered from the milk of 22 cows with suspicious (1 : 50) agglutination tests, including the 10 animals previously mentioned. *B. abortus* was isolated from the milk of 52 out of 102 (50 percent) cows showing positive agglutination tests in serum dilutions of 1 : 100 or greater. It was recovered from the milk of 1 animal with a partial reaction in 1 : 100 and from 8 of 36 milk samples from cows with a titer of 1 : 100. Proper pasteurization has been shown to be an efficient safeguard against exposure to infection by the drinking of milk. *B. abortus* and *M[ycobacterium] tuberculosis* were isolated from a sample of certified milk.

"The incidence of infection in the placentae of full-term, positive cows that gave birth to living calves was shown to be low. *B. abortus* was recovered from 5 of 34 placentae of such animals (15 percent) and from the milk of 18 of 32 of this same group (56 percent). The number of organisms in the fetal membranes of the full-time animals was small in comparison to that in aborted fetal membranes. No evidence was obtained to suggest that regular breeding, positive cows that have healthy calves at full time give less milk than negative animals. Abortions and stillbirths may cause a considerable loss in milk, due to shortened lactation period and actual reduction in quantity."

The nature of milk fever, I, II, J. R. GREIG (*Jersey Bul. and Dairy World, 53 (1934), Nos. 10, pp. 257, 258, 264, 265; 11, pp. 285, 286, 296, 297*).—This is a practical summary of the present status of knowledge of parturient paresis, in which it is pointed out that the essential cause of milk fever is an acute blood calcium deficiency, and that the specific curative action of mammary inflation consists in raising the blood calcium. It is based upon the author's contribution previously noted (E.S.R., 66, p. 467), and includes the results of studies

conducted by the author. Injection of calcium, exclusive of other treatment, raises the blood-calcium concentration and cures the disease.

"No condition of hypocalcemia at all comparable to that which obtains in milk fever was found to occur in any of the disease controls, which numbered 81 and covered a wide range of affections, including general febrile disturbances, pneumonia, pleurisy, postparturient dyspepsia, preparturient paraplegia, tuberculosis, actinomycosis, Johne's disease, contagious abortion, acute digestive disturbances, septic infections, metritis, mastitis, uricaria, tetanus, cerebral coenurosis, painful locomotor affections, and prostration following severe surgical operations."

Two cases of actinomycotic mastitis, H. SMITH (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 635–644, figs. 3*).—Details are given of two cases of actinomycotic mastitis met with in Washington State, presented because of the comparative infrequence of this type of infection in the udder.

The common worms of cattle in India and their control, G. D. BHALERAO (*Agr. and Livestock in India, 4 (1934), No. 1, pp. 3–15, pls. 5*).—A practical illustrated account.

The prophylaxis of fascioliasis and the strongyloidoses of sheep and cattle [trans. title], K. I. SKRJABINE and R. E. SCHULZ (*Off. Internatl. Épizoot. Bul., 7 (1933), No. 1, pp. 195–236*).—Part 1 of this contribution from the U.S.S.R. relates to prophylactic sanitary organization and rural management (pp. 199–212), part 2 to dehelminthization (pp. 212–229), and part 3 to publicity and organization (pp. 229–233).

Experimental studies of foot-rot in sheep, H. MARSH and E. A. TUNNICLIFF (*Montana Sta. Bul. 285 (1934), pp. 29, figs. 10*).—The occurrence of foot rot disease in several sections of the range country of Montana during the last decade, where its control has been a rather difficult problem due to the large number of sheep involved, led to an investigation by the station and the Montana Livestock Sanitary Board, cooperating, of certain phases of the disease and its treatment.

It is concluded from the etiological studies that while *Actinomyces necrophorus* is the primary infective agent in foot rot, as reported by Mohler and Washburn (E.S.R., 16, p 713), there is another factor involved which remains undiscovered. Infectivity experiments have shown (1) the incubation period after placement in a heavily infested wet pasture to be from 10 to 14 days, (2) that soil in open corrals on well-drained land loses its infectivity in 15 to 30 days, (3) that well-drained irrigated pasture in Montana loses its infectivity in 4 mo. of freezing weather, (4) that in a heavily infected subirrigated swamp pasture the infection may persist from one season to the next, and (5) that a heavily infected well-drained irrigated pasture loses its infectivity very rapidly when allowed to become dry.

The experimental treatments proved that saturated (30 percent) copper sulfate solution is entirely satisfactory as a therapeutic agent for treatment of the disease. "Ten percent copper sulfate cannot be depended upon to cure in one treatment. Antimony trichloride (butter of antimony) was not as effective as copper sulfate. One percent sodium hydroxide solution was not effective. The treatment is best administered by standing the sheep in a shallow trough containing the solution. The thorough surgical preparation of the feet is of the utmost importance."

Polyarthritis of sheep, J. A. HOWARTH (*North Amer. Vet., 14 (1933), No. 9, pp. 26–39, figs. 7*).—The studies here reported, presented in connection with a list of 17 references to the literature, indicate that the organism producing polyarthritis and consistently isolated from joint lesions of affected sheep,

belongs to the same family, order, and class as *Erysipelothrix rhusiopathiae*, although the fact that it is not pathogenic for hogs and still shows great similarity in serological and cultural reactions to *E. rhusiopathiae* is unexplained. It is thought that the organism may be a related bacterial strain which, through long years of adaptation to sheep, has acquired certain particular biological characteristics to make it virulent for swine.

"The organism is a pleomorphic diphtheroid, Gram-positive, nonsporulating, nonmotile rod. It is a facultative anaerobe and grows best when placed under CO_2 tension. Inoculations of the organism into healthy lambs induce a polyarthritis characterized by lameness, arthritis, synovitis, and general emaciation. Experimental and field observations give indirect evidence that this organism enters by way of castration and docking wounds, but that in some cases infection may gain entry by way of the navel. Infection may be materially lessened if the lambs are placed on clean pastures at the time of castration and docking and are allowed to remain there until the wounds heal. These organisms have an affinity for, and a precise mode of action upon, the joints, and they seem to have a capacity to secrete a deleterious toxin which in turn produces a marked emaciation. It is not profitable to raise lambs once they show typical symptoms and lesions of this disease. The blood titer of sheep affected with polyarthritis shows a complete or partial agglutination in dilutions from 1–80, 1–160, 1–320, or higher. Polyarthritis, with all of its syndromes, can be produced in healthy sheep by infecting them with swine erysipelas organisms (*E. rhusiopathiae*)."

Sore mouth in sheep transmissible to man, I. E. Newsom and F. Cross (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 799–802, figs. 2*).—This contribution from the Colorado Experiment Station reports upon cases of sore mouth of sheep transmitted from that animal to man.

Grub in the head in sheep in northeastern Nevada: Methods of herding which favored injury and methods of range management which practically eliminate losses, R. Dill (*Nevada Sta. Bul. 135 (1934), pp. 12, figs. 4*).—The author reports that severe losses of sheep were recorded from several herds on ranges in northeastern White Pine County, Nevada, late in the winter and early in the spring of 1933. From 200 to 250 head were lost from many of the herds; deaths were then occurring on several ranges in the same general region; and reports were received of similar losses taking place in an adjacent region in Utah.

The account deals briefly with the symptoms, local injuries, origin of the grub in the head, the problem of preventing the fly from laying its eggs, killing or removal of the maggots in the head, etc.

The life history of Ostertagia circumcincta, W. L. Threlkeld (*Virginia Sta. Tech. Bul. 52 (1934), pp. 24, figs. 21*).—This contribution is said to be the first account relating to the importance of *O. circumcincta* as a parasite of the fourth stomach and small intestine of the sheep east of the Mississippi. It is based upon examinations of animals slaughtered for market at Roanoke and Blacksburg, Va., and upon animals from farms within a radius of 25 miles of Blacksburg brought to the station laboratory for examination. Of 28 animals thus examined, 15 were found to be infected with *O. circumcincta*. These findings are considered to be of particular interest in that these flocks had been treated regularly for the removal of stomach worms, according to standard methods, with copper sulfate and nicotine sulfate.

The studies have shown that "the eggs complete the three-celled stage and possibly the four-celled stage of development within the adult female. The remaining stages usually are accomplished after deposition. The eggs hatch

in from 18 to 24 hr. Eggs hatch into unsheathed larvae which rapidly develop a sheath. This stage is characterized by a phase of activity and one of lethargy lasting for a period of 48 hr. On the third and fourth days the second stage of development is manifested. These larvae are characterized by an increase in length, by change in the structure of the esophagus, and by a gradual occlusion of the pharynx. Third-stage or infective larvae appear on the fifth and sixth days. Uniformly they possess a sheath, a strongyliform esophagus, 16 well-defined intestinal cells, and undergo no further development until they gain entrance to the host.

"Forty-eight hours after oral introduction the larvae are found in the reticulum and rumen but have not yet reached the abomasum. Ecdysis has begun. On the third day one lamb revealed larvae in the third stage of development and in an unsheathed condition. The commencement of sex differentiation is evident by the difference in location of the genital primordium. On the fourth day practically all of the larvae are found coiled deeply within the mucosa, which is highly inflamed, dotted with small elevated areas, and characterized by petechial hemorrhages. On the seventh day fourth-stage larvae are found for the most part unattached to the mucosa of the abomasum. Sex differentiation is well established. Examination on the eighth day revealed larvae in the fourth and fifth stages. Both types of larvae are found within the mucosa. Examination revealed large nodules from which larvae had withdrawn. Larvae observed on the ninth day after infection are practically all unsheathed and exhibit all the characteristics of developing adults. On the fifteenth day a few gravid adults were observed.

"In lamb number 9, which received larvae for 16 consecutive days, a recapitulation of the entire parasitic life was observed. The pathological picture presented by the mucosa was much more severe in character, a fact which shows that repeated infection tends to aggravate conditions caused by the initial infection. During the course of this study all of the internal organs, the lymph system, including the cisterna chyli, the blood from the portal vein, pulmonary vein, mesenteric vein, lung capillaries, the right heart, and the jugular veins were examined in order to ascertain whether the larvae are migratory. No evidence of migration was observed."

The study is reported in connection with a list of 22 references to the literature.

Feedlot diseases of lambs, I. E. Newsom and F. Cross (*Colorado Sta. Bul. 409 (1934), pp. 39, figs. 25*).—This is a revision of Bulletin 305 (E.S.R., 54, p. 277).

Some observations relative to disease in wild deer encountered in northern Minnesota, E. L. Gutschenritter (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 649, 650*).—Reference is made to the occurrence of parasitism by a deer botfly which has resulted in the death of several hundred deer in the northern part of St. Louis County, Minn.

Parasites collected from the moose, Alces americanus, in northern Minnesota, F. G. Wallace (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 770–775, figs. 2*).—Contributing from the Minnesota Experiment Station, the author presents information on the animal parasites of the moose accumulated in the course of an investigation of the disease at the University of Minnesota. A list of 12 references to the literature is included.

Brucelliasis of swine and the biology of Brucella abortus [trans. title], M. Miessner and A. Köser (*Deut. Tierärztl. Wchnschr., 41 (1933), No. 20, pp. 308–313, figs. 3*).—Some investigations conducted by the authors, considered

following a brief review of the literature, deal with clinical and serological findings in sows and patho-anatomical and bacteriological findings in fetuses. The biology of *Brucella* and the combat of brucelliasis are then dealt with at some length. A list of 53 references to the literature is included.

The infectious abortion (brucelliasis) of swine [trans. title], W. N. Makkawejski, I. A. Karkadinowskaja, and N. I. Micheew (*Deut. Tierärztl. Wchnschr., 41 (1933), No. 21, pp. 321–327, figs. 4*).—Following a brief review of the literature relating to the disease in swine, reference is made to studies conducted, including the chemical symptoms, patho-anatomical changes, agglutination reaction in suckling pigs, etc.

Brucella infection of swine, S. H. McNutt (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 620–627, figs. 6*).—Evidence has been obtained in experimental work in Iowa that *Brucella* infection of swine results in a disease in which occur pathological changes of real significance even though clinical symptoms may not be observed. The disease may cause death, a report being given of three animals which died of natural infection. Animals with an agglutination titer of only 1:50 have been found infected. In cases examined, localization of the organism in the uterus has been independent of pregnancy.

Spondylitis of swine associated with bacteria of the Brucella group, W. H. Feldman and C. Olson, Jr. (*Arch. Path. 16 (1933), No. 2, pp. 195–210, figs. 2*).—The authors here report upon a specific spondylitis of swine found associated with bacteria of the genus *Brucella*. In the course of the work lesions were obtained from 24 different animals, and organisms of the *Brucella* group were secured by culture and by inoculations of animals from 10. The identity of the respective cultures was determined by their behavior in experimental animals and by their antigenic properties.

"The affected swine were apparently symptomless and without lesions in other parts of the body. The lesion was an encapsulated, abscesslike structure occupying an irregular cavitation in the body of the vertebra. The disease exhibited an apparent predilection for the vertebrae of the lumbar and sacral region, and adjacent vertebrae were frequently involved. The majority of the specimens obtained were from animals less than one year of age, and a relationship of the lesions of the vertebrae to the usual lesions of infectious abortion in swine was not observed. The presence in many of the necrotic foci of the vertebrae of swine of bacteria of the genus *Brucella*, which have a proved pathogenicity for guinea pigs and rabbits, provides a possible source of infection for farmers, packing house employees, retail butchers, and others who may handle pork in an uncooked state."

Isolation of bacteria of the Brucella group in cases of spondylitis of swine: An additional study, W. H. Feldman and C. Olson, Jr. (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 628–634, figs. 2*).—The findings in the study here reported confirm earlier observations, above noted, that "bacteria of the *Brucella* group are probably of etiologic significance in the pathogenesis of a specific and characteristic form of spondylitis of swine. Twenty specimens from as many different swine were utilized in attempts to demonstrate the causative bacterium by culture and by inoculation of animals. Although in previous work bacteria of the *Brucella* group were obtained in 45 percent of the lesions studied, positive results were secured in only three (15 percent) of the specimens forming the basis of this report. An additional observation is the presence, in a large percentage of cases, of a cap or bridgelike exostosis on the ventral aspect of the involved vertebrae, which characteristically extends across the intervertebral articulation."

"The percentage of instances in which bacteria of the *Brucella* group can be isolated in cases of spondylitis of swine is never high. In the absence of evidence incriminating other pathogenic bacteria in the genesis of these lesions, the unsuccessful results to demonstrate an infection by organisms of the *Brucella* group are best explained by assuming that the etiologic agent is commonly in a state of greatly lessened viability, or even dead."

Tuberculosis of swine in the Philippine Islands, T. Topacio (*Philippine Jour. Sci., 52 (1933), No. 4, pp. 349–369, pls. 3*).—In the author's studies the result of typing 11 strains on the basis of their morphology, cultural behavior, and pathogenicity to the small animals employed strongly indicated that they were of human origin. Attention is called to the fact, however, that it does not follow that the avian or bovine strains may not exist in native hogs, since no study was made of animals on known infected dairy or poultry farms. The account is presented in connection with a list of 23 references to the literature.

Field studies of the larvae of nodular worms of swine, with suggestions for control, L. A. Spindler (*North Amer. Vet. 14 (1933), No. 11, pp. 37–44*).—This contribution relates to the work noted in part from another source (E.S.R., 69, p. 432). Additional data are presented on the number of nodular worms of the different species recovered in post-mortem examination of 367 hogs 4 mo. of age or older from the vicinity of Moultrie, Ga. One hundred percent of these animals were found infested with one or more species of nodular worms. "The infestations were found to range from 1 to 1,820 female worms per animal, with an average of 122 female worms per animal examined. *Oesophagostomum dentatum* was present in 81 percent of the hogs examined post mortem, the infestations varying from 1 to 725 female worms per animal with an average of 62 females per animal. In contrast to the infestations with *O. longicaudum* and *O. dentatum*, the infestations with *O. brevicaudum* were found to be quite light, 38 percent of the hogs examined post mortem being infested with this species. The infestations in this case varied from 1 to 582 females per animal, with an average of 14 worms per animal examined. . . .

"Infective nodular worm larvae were frequently found on moist soil in farrowing houses and beneath sun shelters. Infective larvae were commonly found on moist soil beneath piles of fecal material located in unshaded situations. Under these conditions, larvae were found in many cases to survive dry periods of several weeks' duration. From a study of 'burned over' areas infected with nodular worm larvae, it was determined that burning the dead vegetation on an infested area will not free the land of the nodular worm larvae. In a study of fields infested with nodular worm larvae, lasting over a period 18 mo., it was found that growing a crop on an infested area will apparently free the field of the nodular worm larvae and render the land safe for clean animals. From the results of post-mortem examinations of shoats and studies of the conditions under which these animals had been raised, it is suggested that proper feeding of growing pigs will aid in controlling the spread of nodular worms among these animals."

The 1933 outbreak of infectious equine encephalomyelitis in the Eastern States, L. T. Giltner and M. S. Shahan (*North Amer. Vet., 14 (1933), No. 11, pp. 25–27*).—A brief report is made of the authors' findings in the 1933 outbreak of equine encephalomyelitis which occurred in the East, particularly in Maryland, Delaware, and Virginia.

Equine encephalomyelitis immunization, E. Records and L. R. Vawter (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 784–798*).—In this contribution from the Nevada Experiment Station, the authors describe a method of actively immunizing equines against the western type of equine encephalomye-

litis tested on 591 equines under varied laboratory and field conditions. It consists in the subcutaneous injection of the unattenuated virus in the form of dilute brain suspension.

"The immunity produced within 21 days appears more than ample to protect against natural infection for a period longer than the prevalence of the disease during any one season in a given locality. Spontaneous virus infections did not occur among control horses remaining in contact with virus-injected horses during a period of 7 mo. Resistance to natural or artificial infection and the power of the serum of an animal to neutralize virus in vitro did not appear to be co-related. The method as so far developed is not suitable for general unrestricted or commercial use. Whether or not the method outlined can be applied to the 'eastern' type of encephalomyelitis and the disease it produces in horses has not been determined."

Complement fixation, precipitin, adhesion, mercuric chloride, and Wasserman tests in equine trypanosomiasis of Panama (murrina), W. H. and L. G. Taliaferro (*Jour. Immunol., 26 (1934), No. 3, pp. 193–213*).—In this account the authors report upon a comparison made of complement fixation, precipitin, red blood cell adhesion, and mercuric chloride tests with thick blood film findings in two herds of horses and mules, some of each of which were infected with *Trypanosoma hippicum*.

In general, all of the specific tests, including complement fixation, precipitin, and adhesion, on the untreated herd were more consistent and reliable than the nonspecific mercuric chloride test, while the Wasserman test was almost completely nonreactive. On the whole, all of the specific tests on the treated herd tended to be nonreactive whereas the nonspecific mercuric chloride test tended to be reactive, but in neither group could the reactivity or lack of reactivity be correlated with past infection.

Observations on the length of time first-stage larvae of Gastrophilus **intestinalis remain in the tongue of the horse**, E. E. Wehr (*North Amer. Vet., 14 (1933), No. 10, pp. 35–40, 41*).—A report of studies (E.S.R., 70, p. 98) of the biology of the horse botfly, the larvae of which spend a certain period in the mucous membrane of the tongue, cheeks, and lips as a regular part, and perhaps a necessary part, of their life cycle within the host animal.

Unrecognized parasitism in a yearling colt, L. B. Sholl (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 651–653*).—This is a case report of a colt, a post-mortem examination of which showed the presence of 12 horse botflies in the somach and 14 *Ascaris equorum* in the small intestine. "The diagnosis is unquestionably parasitism, and the symptoms manifested by the patient were probably due to toxemia."

Investigations of canine diseases, with special reference to rabies.—Preliminary report, M. F. Barnes, A. N. Metcalfe, and W. J. Lentz (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 1, pp. 34–52*).—This is a preliminary account of work conducted with rabies, the details of which are presented in 17 tables, but from which no conclusions are drawn.

Canine rabies experimental vaccination.—Second and third reports, M. F. Barnes, A. N. Metcalfe, W. E. Martindale, and W. J. Lentz (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 740–751*).—This report of further work with rabies, which deals particularly with chloroform-treated vaccine and incubation periods following artificial exposures, the details being presented in 13 tables, has led to the drawing of the following tentative conclusions:

"Our experiments indicated that the carbolized vaccines used did not immunize against rabies. The experimental use of chloroform-treated vaccine has offered somewhat more encouraging results than the carbolized vaccine,

but not sufficient to warrant confidence in it to the exclusion of sanitary and police measures. Apparently no harmful effects are caused by the vaccine, and it is doubtful if enough good can come from its use to justify the expense involved. Sanitary officials should not rely on vaccination as a means of rabies control. Effective quarantine has successfully controlled rabies in districts where enforced. All dogs known to have been exposed to rabies should be killed. The usual 100-day quarantine does not furnish positive assurance that cases of rabies will not develop later, although for practical purposes it probably should not be increased. There undoubtedly is a successful way of immunizing dogs against rabies, but neither the proper method nor the proper vaccine seems to have been found."

Rabies vaccine protection test, J. Reichel and J. E. Schneider (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 752–758*).—The authors find that the intralingual injection of the infective dose of rabies virus makes it possible to obtain fairly consistent results in the potency testing of rabies vaccines. The results of rabbit and dog protection tests approximate each other closely. In both tests the end results are deemed satisfactory when at least 60 percent of the vaccinated animals survive, while 60 percent or more of the controls died of the intralingual infective dose.

Formalin-killed and autoclave-killed rabies vaccines failed to pass the protection test, indicating that the formalin and heat similarly affected the potency of the products. Chloroform-killed and phenol-killed rabies vaccines passed the protection test, as did the live rabies vaccine.

Epizootic fox encephalitis, V, VI (*Amer. Jour. Hyg., 19 (1934), No. 2, pp. 343–361; 362–391, figs. 10*).—Two contributions are presented in continuation of those previously noted (E.S.R., 70, p. 684).

V. *General and pathogenic properties of the virus,* R. G. Green, N. R. Ziegler, W. E. Carlson, J. E. Shillinger, S. H. Tyler, and E. T. Dewey.—"The virus of fox encephalitis remains viable in an animal carcass for several days after death and may be stored in 50 percent glycerin for several years without loss of virulence. The virus is easily filtrable through Berkefeld N filters, and the specific inclusions typical of this disease occur in animals infected with filtrates.

"The susceptibility of the coyote to this virus appears equal to that of the red fox. In experimental infections produced in the coyote by cisterna inoculation the typical intranuclear inclusions occur consistently in the endothelial cells of the meninges, less consistently in the brain substance, and rarely in the ependymal cells. The specific inclusions occur also in the hepatic and endothelial cells of the liver and in the endothelial cells of the kidney, adrenal, and spleen. Inclusions are also found in the reticuloendothelial cells of the liver, spleen, and lymph node, and in the cortical cells of the adrenal.

"The gray fox is resistant to this virus, as is the mink. Attempts to produce an infection with this virus in rabbits, even by special procedures designed to allow adaptation, met with failure. The virus appears nonpathogenic for white rats, squirrels, guinea pigs, and cats.

"Dogs have been found fairly susceptible to the virus. Susceptibility and resistance in this animal often appear as litter characteristics. Intranuclear inclusions typical of this virus are produced abundantly in the dog, not only in the central nervous system but also in the thoracic and abdominal organs.

"Ferrets appear resistant to infection with this virus. Sheep appear entirely immune. It was not found possible to demonstrate any invasive powers of this virus for monkeys."

VI. *A description of the experimental infection in dogs,* R. G. Green and J. E. Shillinger.—It was found that dogs may be experimentally infected

with the virus of fox encephalitis, the fatal infection usually running a short, violent course of less than a week in a manner similar to that of the infection in foxes.

A filtrable virus from a pandemic disease in rabbits, L. PEARCE, P. D. ROSAHN, and C. K. HU (*Arch. Path., 16 (1933), No. 2, pp. 300–302*).—An account is given of a highly contagious and fatal disease that broke out in December 1932 in a rabbit breeding colony and spread so rapidly that within a month every animal in the colony of 1,500 rabbits had been infected. Clinically the disease resembled smallpox in man, and the authors have given it the name of "rabbit pox." It was characterized by fever, prostration, general adenopathy, and a pocklike eruption of variable extent on the skin and mucous membranes. The incubation period was from 5 to 10 days.

"The degree and the course of the infection varied widely. In cases of severe infection the majority of the rabbits were markedly prostrated and were evidently extremely ill, but some animals with extensive lesions appeared to be in perfect health. Many animals showed an apparently complete recovery from a severe infection, the visible lesions healing with scar formation. Death frequently occurred within a few hours after the first signs of the infection were noted or after a period of days or weeks. The mortality varied with the breed, sex, age, and physiologic status. Among animals under 2 weeks of age the mortality approximated 100 percent, but it decreased with age until in normal adults it was less than 20 percent. In the animals of Himalayan stock there were no deaths among adults, while in others, such as the Belgian rabbits, the death rate was extremely high. Abortions were frequent.

"The acute phase of the pandemic lasted about 4 weeks. After this time the daily incidence of fresh cases and of deaths dropped fairly abruptly. In general, the later cases were milder than the earlier ones, this being particularly noticeable in young animals; however, instances of severe disease did occur."

[Report of work in avian pathology at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1933], pp. 74, 75, 92–94*).—Brief reference is made to the progress of work (E.S.R., 69, p. 278) with coccidiosis, blackhead, and, by J. P. Delaplane and H. O. Stuart, with rhinitis, a respiratory disease of chickens, reference to which has been noted (E.S.R., 69, p. 435).

Phosphorous poisoning in poultry, F. R. BEAUDETTE, C. H. HUDSON, and A. L. WEBER (*North Amer. Vet., 14 (1933), No. 7, pp. 39–42, 51*).—In this contribution from the New Jersey Experiment Stations the authors give reports of 16 cases of phosphorus poisoning involving poultry and 1 case of a cat, encountered during the preceding 9 yr. Two of the cases occurred on the same farm, and in all 24 birds and 1 cat were examined. It is said that while some of the cases of phosphorus poisoning were accidental and occurred through chickens eating rat poison, the majority of the cases investigated resulted from intentional poisoning. There was sufficient phosphorus present to be detected by the characteristic odor, and in most cases phosphorus fumes escaped from the crop or gizzard or from both.

Some practical results of experiments on coccidiosis in chickens, R. L. MATHEW (*Louisiana Sta. Circ. 7 (1934), pp. 4*).—A brief practical account of control measures for avian coccidiosis. Experiments at the station show that "birds which have had a severe attack of the disease never become profitable because (1) they do not attain normal weight within 5 to 6 mo. after the attack, (2) they do not begin to lay until 6½ weeks older (on the average)

than uninfected birds, and (3) they lay only about one half as many eggs as the uninfected birds.

"Numerous and careful experiments show that during the 3 mo. following the attack of coccidiosis there is an actual loss in profits to the poultryman of from 10 to 40 percent due to the slower rate of growth. In one of these lots at the time the 25 cockerels weighed 2 lb. each. This loss was 14 percent of the profit and the total loss from the epidemic, including loss by death, amounted to $3.50, a considerable part of the feed costs for the lot."

In an experiment conducted birds that had been severely affected laid only 54.5 percent as many eggs as those not affected. Sexual maturity was also delayed 6½ weeks in the severely attacked group, which necessitated extra feed and labor expenditures before laying began.

Studies on the common cold in chickens, M. R. Lewis and E. Mueller (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 759–769*).—In the studies conducted "the causative agent of the common cold of chickens failed to behave in a manner characteristic of the usual so-called filtrable virus diseases in that it did not confer a lasting immunity in the individuals recovered from the disease, it was not accompanied by a characteristic inclusion body in the cells of the lesion, it did not pass the bacteriologic filters, it was removed from solutions by amounts of particular substances that removed bacteria, and it was present in 24-hour incubated broth cultures of the virus but not in those that were free from bacteria."

A list is given of 14 references to the literature.

Some studies of infectious laryngotracheitis.—A preliminary report, C. A. Brandly (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 588–595*).—The author has found in studies in Kansas that the virus of infectious laryngotracheitis within or upon the surface of the egg does not seem to survive, except for short periods, in the environment to which the hen's egg is subjected during incubation. "The development of normal chicks from infected or carrier flocks, as well as from eggs artificially inoculated on the tenth day of incubation, further indicates that the danger of infection via the egg is not significant. The results of the inoculations of eggs incubated for 10 days support the field observations that laryngotracheitis infection in a flock may directly or indirectly reduce the hatchability."

Lymphomatosis, myelomatosis, and endothelioma of chickens caused by a filterable agent.—II, Morphological characteristics of the endotheliomata caused by this agent, J. Furth (*Jour. Expt. Med., 59 (1934), No. 4, pp. 501–517, pls. 5*).—In continuation of the work previously noted (E.S.R., 70, p. 685), part 2 deals with the morphological characteristics of the endotheliomata caused by the filtrable agent in connection with a list of 16 references to the literature.

Studies on histomoniasis, or "blackhead" infection, in the chicken and the turkey, E. E. Tyzzer (*Amer. Acad. Arts and Sci. Proc., 69 (1934), No. 5, pp. 189–264, pls. 6*).—Following a brief introduction, part 2 of this contribution deals with experimental histomoniasis in young turkeys and chickens, with observations on various forms of typhlitis (pp. 193–212), part 3 with *Histomonas meleagridis* in the avian carrier, in culture, and in the cecal worm *Heterakis gallinae* (pp. 213–242), and part 4 with loss of virulence in *H. meleagridis* in culture and the immunizing properties of an attenuated strain (pp. 243–262). Part 5 consists of a bibliography (pp. 262–264). An account by the author relating to the loss of virulence in the protozoan of blackhead and the immunizing properties of attenuated strains has been noted (E.S.R., 70, p. 836).

A new heterophile antigen common to avian erythrocytes and some varieties of genus Pasteurella: Its significance in the classification of birds, L. Buchbinder (*Jour. Immunol., 26 (1934), No. 3, pp. 215–231*).—In this contribution, in which the author was assisted by W. Rubin and presented in connection with a list of 19 references to the literature, "the presence of a new heterophile antigen in some strains of the hemorrhagic septicemia group of bacteria and in the erythrocytes of birds is described. In contrast to the apparent chance appearance of this antigen in members of the *Pasteurella* group of organisms, it is present in many birds in an orderly fashion. The significance of this heterophile antigen in bird erythrocytes is discussed from the standpoint of species evolution. Additional strains of the hemorrhagic septicemia organism containing Forssman's heterophile antigen are described."

Pyrethrum as an anthelmintic for Ascaridia lineata, R. E. Rebrassier (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 645–648*).—In experimental work at the Ohio Experiment Station powdered pyrethrum in doses of 200 mg, containing 0.8 percent pyrethrin, was administered to 30 adult chickens to determine the efficiency of the drug in removing *A. lineata*. "The droppings of each bird, voided over a period of 72 hours following treatment, were examined for *A. lineata*. These birds were then killed and examined for the presence of *A. lineata*. Twenty-four birds eliminated all *A. lineata* following treatment, and only 1 bird failed to pass worms. Five birds passed *A. lineata* but did not completely eliminate them. The efficacy of pyrethrum against *A. lineata*, based on a worm total, was found to be 95.14 percent."

A malaria-like disease of ducks caused by Leucocytozoon anatis Wickware, E. C. O'Roke (*Mich. Univ., School Forestry and Conserv. Bul. 4 (1934), pp. 44, pls. 5*).—This contribution, presented in connection with a list of 17 references to the literature, deals with the results of a three-year investigation of a previously little-known disease due to *L. anatis* which was responsible for heavy loss among both wild and tame ducks. An account of the life cycle and transmission of this organism by the black fly *Simulium venustum* is followed by a discussion of the disease resulting.

Control of the disease in domestic ducks through management is considered practical, the procedure recommended and means of control including (1) the rearing of ducks in areas free from black flies, (2) culling out parasitized carrier adults, (3) screening young ducklings from the attacks of black flies, (4) confining ducklings in cool, dark sheds, (5) hatching ducklings before or after the main black fly season, and (6) the removing of parasitized young ducks before they become infective to black flies.

A preliminary report on trichomoniasis of pigeons, E. F. Waller (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 4, pp. 596–602*).—A disease of squabs due to trichomonads that has not previously been reported from America has been observed by the Minnesota Experiment Station in two lofts of homing pigeons in the vicinity of University Farm. "The condition is manifested by the development of necrotic areas in the liver, pancreas, peritoneum, pericardium, and lungs. Mature birds have been found resistant to natural infection. Since the disease has been transmitted by feeding the organism to susceptible birds, the probability of an intermediate host has been practically eliminated."

A note on so-called quail disease, E. H. Barger, S. E. Park, and R. Graham (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 5, pp. 776–783, fig. 1*).—The so-called "quail disease" which appeared suddenly in Illinois during the summer of 1932 on a quail farm that had been in operation less than 9 mo. is dealt with. The presence of a filtrable virus could not be demonstrated in the

tissues of fatally infected quail. "Streptococci, diplococci, and *E[scherichia] coli* were isolated in direct culture from quail tissues. *S[treptococcus] aertrycke* was isolated from one spontaneously fatally affected quail via inoculation of tissue emulsion into susceptible animals. Bacteriologic examination and animal inoculation of 56 quail eggs from the breeding flock failed to yield any evidence of the presence of a pathogenic virus. The immeasurable environmental factor or factors, such as confinement per se, as well as hatching, rearing, and feeding quail on restricted range, might obviously culminate in disturbed or altered physiologic functions. In such quail it is reasonable to assume that nonpathogenic agents might assume a pathogenic role."

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Ohio Station], G. W. McCuen, E. A. Silver, R. C. Miller, C. J. Willard, V. L. Overholt, D. Comin, H. D. Brown, C. O. Reed, R. M. Salter, Young, and [N. R.] Bear (*Ohio Sta. Bul. 532 (1934), pp. 86–92, 102–104, figs. 2*).—The progress results are presented of studies on tire equipment for tractors, wheel equipment for farm wagons or trailers, wear on plowshares, threshing machines, chopped hay, baling hay from the windrow, subirrigation and drainage, fertilizer application with corn planters, and erosion control.

Reconnaissance erosion survey of the Brazos River watershed, Texas, H. V. Geib and I. T. Goddard (*U.S. Dept. Agr., Misc. Pub. 186 (1934), pp. 47, figs. 31*).—This publication presents the results of a reconnaissance erosion survey of an area of a little more than 27,000,000 acres, comprising 70 counties and parts of counties lying within the Brazos River watershed in Texas. The survey was made in cooperation with the Texas and Oklahoma Experiment Stations.

Results of level terracing on heavy silt loam soil, H. H. Finnell (*[Oklahoma] Panhandle Sta., Panhandle Bul. 53 (1934), pp. 12*).—This bulletin embodies a summary of general observations previously reported (E.S.R., 66, p. 181) and a preliminary report on the results of different terracing spaces observed over the period 1930–33.

A total grain yield increase of 32.6 percent secured by terraces over the 8-year period 1926–33 was recorded on heavy silt loam soil at Goodwell, Okla., under a normal rainfall of 17.8 in. The land on which these results were obtained has a natural slope of 1 percent or less.

That the increased yields were due entirely to additional moisture supplies provided by saving of runoff is indicated both by the increased soil moisture supply observed under terraced conditions and by the correspondence of yield increases to the amount of runoff liability experiences in the different seasons.

The yield results of different terrace spacings indicated that more frequent terraces were required on the heavy soils to obtain a given moisture using efficiency than on lighter types of the same slope, and probably that contour listing would be required to get the maximum results in connection with terracing.

The pressure on retaining-walls, C. F. Jenkin (*Inst. Civ. Engin. [London], Minutes Proc., 234 (1931–32), pt. 2, pp. 103–223, figs. 57*).—This paper, which is a contribution from Oxford University, describes the latest design used in experimental apparatus for testing the pressure on retaining walls and gives the results of a large number of measurements of the pressure exerted by sand on walls of several different shapes. A revised wedge theory is developed which explains the observed phenomena, and practical working rules are given for calculating the forces.

Guide to the grading of structural timbers and the determination of working stresses, T. R. C. Wilson (*U.S. Dept. Agr., Misc. Pub. 185 (1934), pp. 27*).—This circular presents a generalized system for specifying the features that affect the strength of timbers, together with a procedure for determining the working stresses appropriate to any grade. With the help of the data given, individual pieces or lots of timber can be graded by the user or distributor, grade descriptions can be prepared by the lumber manufacturer or user, and working stresses for grades described in lumber association rules or elsewhere can be determined or checked by the engineer, architect, or contractor.

Part 1 presents grade descriptions in blank. Only paragraphs relating to features that affect strength are included. Part 2 supplies data to fill the blanks and makes the descriptions applicable to grades having strength ratios as desired. Details in which part 1 differs from American lumber standards are indicated by italics and are commented on in footnotes. Part 3 discusses topics related to grading for strength, part 4 shows how to determine the working stress appropriate to a grade, and part 5 evaluates existing commercial grades.

The effect of low temperature on the strength of wood, H. O. George (*N.Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 43 (1933), pp. 18, fig. 1*).—*The results of static bending, compression parallel and perpendicular to the grain, shear along the grain, and hardness tests on three species of wood in* both the frozen and normal conditions are reported. Two series of such tests were run on each species—the first on green and the second on kiln-dried wood. The species included hard maple, black ash, and white pine.

It was found that wood is stronger when in a frozen state than at ordinary temperatures. Were wood obtainable showing no variation either in structure or specific gravity, every test of the frozen material would doubtless give higher values than at room temperature. Influence of cold on strength of wood is largely a matter of change of state of the moisture contained in the cell walls. Because of the greater amount of imbibed moisture in green than in dry wood, the strength increase due to freezing is greater above than below the fiber-saturation point. The influence of cold on the strength of wood is not sufficiently great to be taken into consideration in designing structures. This is always toward increased safety, and therefore further research is of primary interest only from the standpoint of pure science. Ice damage in standing timber may be attributed entirely to excessive load and wind effects, since here again the influence of cold is to lessen the danger of breakage.

The strength properties of small beams (match stick size) of southern yellow pine, C. C. Forsaith (*N.Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 42 (1933), pp. 38, [figs.] 8*).—Studies are reported the purpose of which was to determine if differences in strength of loblolly pine might be correlated to some degree with variations in orientation and anatomy as well as in density and moisture content. For this purpose a wood was selected with pronounced anatomical variation from which test beams were cut to small dimensions in order that anatomical differences might be large in comparison with over-all dimensional values. The methods of testing used very closely paralleled standard procedure.

Three types of beams were prepared: (1) Those consisting wholly of spring wood or of summer wood, (2) those from the same or different increments with one spring wood face and one summer wood face, and (3) those from two rings with a more or less centrally placed band of summer wood flanked on either side by surface bands of spring wood

It was found that the neutral plane will not occupy a median position in small beams consisting of spring wood and summer wood when the pressure is applied to the tangential surface of the wood. Its position will be determined by the volume and the density of these two types of tissue. A shift of the neutral axis tends to increase the stresses in the spring wood and to decrease those which develop in the summer wood. In southern yellow pine the summer wood appears to be stronger in compression than the spring wood in tension. The difference between the ultimate strength in tension and compression is greater in spring wood than in summer wood.

Small beams in which one face consists of spring wood and one of summer wood are strongest when the pressure is applied across the radial face of the wood, and weakest when the pressure is applied across the tangential face of the spring wood (the L-type of loading). The fiber stress at the elastic limit approaches nearest to the ultimate strength when the pressure is applied to the tangential face of the summer wood (the U-type of loading).

Stiffness is more or less controlled by the summer wood. Wood formed during the early life of a tree appears to be weaker but less brittle than that produced during the later years. At the point of maximum stress local differences in structure, if they be large in comparison with the over-all dimensions of the beam, may influence its strength to a greater degree than the specific gravity, and strength and density may not be proportional. The type of failure in small beams will be determined by their orientation in respect to the load, especially in those cases where the pressure is applied to the tangential surface of the wood. When the spring wood is uppermost they will fail by compression, and when the summer wood is uppermost they will fail by tension and longitudinal shear along the grain. The location of the maximum stress, even to within the length of a few microns, is generally more important in determining the line of failure than are variations in structure such as rays and pits. The line of fracture, except in the thin-walled tracheids, tends to follow the middle lamella, and where it crosses from cell to cell it tends to follow around the margin of the pit flange rather than through the orifice. The compression failure under the bearing plate extends only to the depth of a few cells. Compression failures in spring wood result from a buckling of the tracheid walls and in the summer wood from a split in the middle lamella. Spring wood tracheids failing by tension exhibit a smooth transverse surface of the brash type, while the summer wood tracheids show a splintered type of failure.

Properties of white fir and their relation to the manufacture and uses of the wood, R. P. A. Johnson and M. R. Brundage (*U.S. Dept. Agr., Tech. Bul. 408 (1934), pp. 77, pls. 10, figs. 31*).—This bulletin, prepared in cooperation with the California Forest Experiment Station and the University of Wisconsin, furnishes detailed information on the properties and characteristics of the wood of white fir for use in determining the suitability of this wood for specific use.

A study of the screw-holding properties of wood, R. A. Cockrell (*N.Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 44 (1933), pp. 28, [figs.] 3*).—Studies are reported the purpose of which was to determine to what extent variations in the structure and physical characteristics of wood influence its screw-holding power. Several kinds of wood of commercial importance were used. The standard flathead type of screw was selected for the investigation in the 3 sizes 1 in. No. 6, No. 8, and No. 10.

It was found that the woods tested may be listed in order of their screw-holding strengths, as follows: Maple, beech, birch, red oak, black ash, red pine, hemlock, red spruce, white pine, and basswood. In a general sense the specific gravity of wood can be used as an index of screw-holding ability, since the

screw-holding strength varies within narrow limits as the first power of the density. There is considerable variation in screw-holding power in woods of almost equal density which must be due to inherent qualities of individual species. When wood was dried from above the fiber saturation point to 7 percent moisture content, an average increase in screw-holding strength of 50 percent was noted. This is only one third to one quarter of the increase in most other strength properties for the same change in moisture content.

In general diffuse-porous hardwoods, especially those of high density, and conifers of irregular growth and uneven texture are stronger in screw-holding power from their tangential surfaces, while ring-porous hardwoods and conifers of regular growth and fairly even texture are stronger from their radial surfaces. The average holding strength of dry wood in end-grain pulling was 65 percent of the side-grain values.

The strength values for small size screws extracted from the radial surface of a ring-porous wood presented a much greater range of values than those extracted from a uniformly textured wood. Ring-porous woods are less desirable for application necessitating strong screw-holding ability than diffuse-porous woods of approximately the same density. Other conditions remaining constant, a screw can be unscrewed from wood and replaced in its original lead hole with no loss of holding power. In making use of screw-holding values, a factor of safety of two should be the absolute minimum employed. The average resistance of wood to a force applied laterally to a screw is about 100 percent greater than its resistance to the axial withdrawal. The quality of side-hardness appears to be more closely related to screw-holding ability than any other strength property of wood.

Testing and selection of commercial wood preservatives, S. Kamesam (*Forest Res. Inst., Dehra Dun, Forest Bul. 81 (1933), pp. IV+40, figs. 2*).—The results of tests of commercial wood preservatives are presented, including experiments with a few proprietary water-soluble salt antiseptics. The results relate to typical wood-destroying fungi and to two species of beetles.

It has been found that timber located permanently in water or below the permanent level of saturation in soil requires no preservative treatment. Timber installed in outside locations, and not naturally durable, requires a preservative treatment, usually under pressure so that the deepest possible penetration of the preservative is secured. Coal tar creosote is generally the most suitable preservative for such timbers, but not always the most economical on account of its relatively high cost. Wood tar creosote does not appear to be efficient against white ant attack. For a protective treatment to timber in place, it is recommended that two or three brush coats of a high-boiling creosote or carbolineum be applied or a 5 percent solution of one of the arsenic compounds that are not easily leached out of wood.

For timber foundations of bridges, bridge approaches, buildings, workshops, machines, engine turntables, etc., it is always safer to use properly treated timber unless one is certain that the piles remain permanently submerged in water. Generally speaking, the best preservatives for such purposes as well as for all outside locations are those containing creosote or copper and arsenic as their main toxic principle if an economically long life is to be secured.

In the case of timber partly below and partly above the ground level, the portion that requires the greatest degree of protection is that near the ground level. Such timber, if a costly treatment is to be avoided, may be given a butt treatment so that at least up to about a foot length of the timber above the ground level is treated with the preservative. In localities infested badly with white

ants, it is safer to give a full length treatment, besides a water-proofing treatment with a crude oil emulsion with asphalt for the butt or for the whole length.

Timber that is lying in contact with the ground, especially where the water does not drain off easily, requires a good pressure treatment. Timber that is exposed only to the elements and not in contact with the ground does not require a very drastic treatment except at points where there is a liability for water to accumulate.

In the case of timber used in brackish or sea water, a very drastic creosote or copper arsenic treatment is required on account of the danger of its being attacked by *Teredo*, *Limnoria*, etc. A combined treatment with copper and arsenic was developed by the author and found to be quite efficient for the preservation of fence posts. Preservatives recommended for timber in inside locations, such as for furniture, trim, cabinet work, and the like, include copper sulfate, sodium fluoride, magnesium silicofluoride, zinc chloride, and chlorinated naphthalene, chiefly trichloronaphthalene. In locations where there is danger of severe termite attack, it is considered advisable to use an arsenic or copper sulfate solution, the latter being especially recommended in humid atmospheric conditions where arsenic should not be used.

Under conditions where the timber requires to be protected only from fungi, magnesium silicofluoride is more suitable than sodium fluoride for timber in moist rooms as in basement and refrigerator chambers, mines, etc. When treated timber is used for permanent or semipermanent structures in outside locations, endeavor should be made to use, as far as possible, timber in the round and to treat it under pressure after previously framing it.

The preservative treatment of shade tent poles, H. W. Hicock (*Connecticut [New Haven] Sta. Bul. 359 (1934), pp. 373–377, fig. 1*).—The results of a series of experiments are reported in which wood of 5 native species was given full pressure treatment, open tank (hot and cold bath) treatment, brush treatment, and treater dust treatment to determine their value as substitutes for chestnut poles.

After 5 years' service in the soil, all poles treated by the full pressure process were sound throughout and the butts of all but two poles treated by the open tank method were sound. Brush treatment is entirely superficial, and little or no impregnation of the wood results. The butts of all poles set with treater dust in the hole were sound, but while the cost of this material is quite low and the results compare favorably with impregnation treatments after 5 yr., this compound cannot be recommended on account of its extremely poisonous nature.

The butts of all poles which were set untreated had become entirely unserviceable at the end of 3 yr. with the exception of pitch pine, and these became unserviceable in 5 yr.

At the end of 5 yr., with few exceptions, the untreated tops of topple, gray birch, and red maple poles had become unserviceable while the untreated tops of white and pitch pine poles showed very little indication of decay. The tops of all poles which had either an impregnation treatment (full pressure) or a superficial treatment by brushing or dipping were, with very few exceptions, sound and serviceable at the end of 5 yr.

These results indicate that the tops of poles need some kind of preservative treatment to maintain a balance of life between top and butt. Heavy impregnation of tops such as is secured by pressure treatment probably involves an unjustified expense. Moreover, pressure treated poles are likely to bleed in warm weather, especially if tar is used, and this may prove injurious to tobacco. A superficial treatment of tops by dipping or brushing in an open tank treat-

ment of butts has maintained a satisfactory balance of life between top and butt for a period of 5 yr. Poles treated superficially do not bleed unduly.

From the standpoint of physical properties, abundance, adaptability to treatment, and demonstrated results, pitch pine and red maple seem to best fulfill the requirements for tobacco poles. However, from more recent experiments, for which there are at present no service records available, it would seem that the several species of oak and red and scotch pine may also be sources of pole material.

Reinforced concrete fence posts [trans. title], I. COULPIER (*Jour. Agr. Prat., 97 (1933), No. 46, pp. 419–421, figs. 2*).—French practice in the design and manufacture of concrete fence posts for farm use is briefly described. The manufacture of an all concrete fence including posts and upright pickets is also described.

The physical-chemical properties of alcohol-gasoline blends.—III, The A.S.T.M. distillation curves and Reid vapor pressure, L. M. CHRISTENSEN, R. M. HIXON, and E. I. FULMER (*Iowa State Col. Jour. Sci., 8 (1934), No. 2, pp. 237–244, figs. 3*).—Studies conducted at the Iowa State College (E.S.R., 70, p. 254) are reported in which it was found that the A.S.T.M. distillation data for a fuel can be used as a qualitative measure of the performance of the fuel in a motor. It was found that the initial temperature of distillation of alcohol blends and the temperature of the first 10 percent distilling are not appreciably changed until alcohol concentrations of 40 percent or more are reached.

So far as volatility of fuel is concerned, there should be no appreciable difference in the starting qualities of the blends containing 10 or 20 percent of alcohol and that of the original gasoline. The temperature of volatilization of the first 30 percent of the fuel was much lower for the alcohol blends than for the original gasoline. The temperature of volatilization of the first 60 percent of the fuel was very slightly affected by 10 percent alcohol and depressed approximately 30° F. by 20 percent alcohol. In harmony with this fact, very little difference could be observed in the power output of a hot motor when operating on the 10 percent blend or the original gasoline, and the general observation was that motor operation was smoother on the original blend than on the gasoline. The temperature of volatilization of the last 10 percent of the fuel was not affected by 10 percent alcohol but was lowered by the addition of 20 percent or more of alcohol. The addition of alcohol to gasoline was found not to alter appreciably the volatility of the low-boiling constituents which would distill over the first 15 percent of the fuel, leading to the observation that vapor lock will not be encountered on blending alcohol with a gasoline which is itself free from this tendency. Data also are presented on the storage of alcohol blends.

Carburants containing a high percentage of alcohol [trans. title], S. DOLDI (*Gior. Chim. Indus. ed Appl., 15 (1933), No. 12, pp. 593–598, figs. 4*).—An account is given of a thermal process whereby it is possible to produce an internal-combustion engine fuel containing a high percentage of alcohol and which may be used directly in a common gasoline engine. Data are given on the physical and chemical characteristics of such fuels and of their value as compared with gasoline. These fuels consist of mixtures of methanol or ethanol with benzol in proportions containing up to 74 percent of the alcohol. In certain proportions the mixed alcohol fuel has been found to have a volumetric efficiency equal to that of gasoline, but the calorific value of the gasoline is considerably higher. The temperature of the exhaust gases of the high alcohol mixture is higher than those of gasoline. Apparently the mixture containing 32 percent alcohol and 68 percent benzol has about the limiting proportion of alcohol for gasoline engines of normal compression ratios.

Vegetable carburants [trans. title], A. C. Roux (*Rev. Internatl. Prod. Colon.*, *7 (1932), No. 84, pp. 369–416, pls. 10, figs. 2*).—Studies of African fuels and carburants of vegetable origin indicated the possibility of obtaining solid, liquid, and gaseous fuels by the use solely of raw plant materials yielding alcohol and oil. Tests of oleaginous seeds and nuts showed that all these materials yield a crude gasoline at low temperature carbonization. From this material light and heavy spirits, lamp oil, gas oil, and fuel oil can be extracted. Ammonia also is present in the residual liquids.

A progress report of investigations of the various uses of electricity on the farms of Washington for the year 1933, L. J. Smith and H. L. Garver (*[Pullman]: Wash. Com. Relat. Elect. Agr., 1933 pp. 42, figs. 9*).—This report presents data secured during the year from studies of water heating for dairy stock, potato and root washers, apple washers, evaporation of irrigation water, pasture irrigation, and miscellaneous studies relating to water heating, ultraviolet radiations on apple grafts, and the like.

In the studies on water heating for dairy stock, tests made during the winter with 18 cows showed no increase in milk production due to the warming of the drinking water. This was true with both high and low producers. Apparently there is no advantage in warming the drinking water unless it is more economical to supply enough heat to keep the trough free of ice than to take the ice off three or four times daily.

In the pasture irrigation experiments it was found that irrigation is valuable in bringing on new pasture and in bringing back pasture that has been partially winter-killed. It tends to reduce the percentage of weeds and helps fall pasture growth. Labor was found to be often the most expensive item in the cost of putting the water on the land. For practical and economical pasture irrigation the land must have uniform slopes and the volume of the water should not be too small. Apparently there is no advantage in overirrigation.

Air wheels for tractors, F. W. Barrett, F. L. Fairbanks, and W. H. Ashton (*N.Y. State Col. Agr., Dept. Agr. Engin. Mimeogr. Bul. 253 [1933], pp. 11, figs. 15*).—The results of tests of air wheels on tractors during the 1933 season in such field operations as plowing, harrowing, drilling, grain binding, haying, and road work are reported in graphic form and discussed. The soil on which the plowing and harrowing were done was Canfield silt loam, and all plowing was on a light sod. The road tests were made on water-bound macadam, firm dirt, macadam, and concrete, both wet and dry.

Since the air wheels were considerably lighter than the standard tractor steel wheel, weights of about 150 lb. each were attached to the air wheel to supply the necessary traction weight. It was found that this increased the available drawbar pull. Under all conditions the available pull on soft plowed ground was less than on firm footing.

No very definite conclusions are drawn from the data. It is noted, however, that the air wheeels used during the season showed very little wear in comparison to the work done.

Raising the soil temperature in glasshouses, W. F. Bewley (*Jour. Min. Agr. [Gt. Brit.], 40 (1934), No. 11, pp. 1047–1056*).—The results of experiments on heating glasshouse soils by electricity and hot water are summarized. These covered a period of several years and resulted in the extensive development of the hot-water method as being cheaper and as satisfactory as the electrical method.

The results showed, in general, that when the soil temperature is raised to 80° F. during the first three months of the season, there is a definite improvement in the tomato crop. Root development is greater, and the roots

are cleaner than in soil at ordinary temperatures. Vegetative growth is more vigorous, and the plants remain green and healthy beyond the time at which they are usually removed. The first box of fruit is not usually picked earlier, but the main crop ripens more quickly and a greater weight is picked during the first month. With cucumbers, heavier and earlier crops have been obtained.

Much of the root trouble which has made soil sterilization so necessary is the result of unsuitable physical and chemical conditions. These appear to be overcome by increasing the soil temperature. On the other hand some diseases would not be affected, while eelworm attack, which thrives under hot, dry conditions, might be expected to become more serious.

The necessary apparatus includes (1) a hot-water boiler for providing water at a temperature of about 140°; (2) an electric pump with starting device controlled by a soil thermostat; and (3) a quantity of one-inch pipe. The pipe, which should be specially treated to prolong its life in the soil, should be buried 2 ft. below the surface in tomato houses and placed so that the lengths are 2 ft. apart.

Central soil heating by means of low pressure steam or hot water using a hot water heater and circulating pump [trans. title], W. ZIMMERMANN (*Gsndhts. Ingen., 56 (1933), No. 51, pp. 601–605, fig. 1*).—Data are presented for use in the design of steam and hot-water systems for the heating of greenhouse and hotbed soils.

Adaptability and cost of electric heat for greenhouses, G. N. HAWLEY (*Elect. West, 72 (1934), No. 3, pp. 22, 23, figs. 2*).—Brief information is given on the assembly of electric heating systems for greenhouses.

Soil heating wire for stock and poultry drinking water heaters, H. BERESFORD (*Elect. West, 72 (1934), No. 3, pp. 23, 24, figs. 2*).—In a brief contribution from the Idaho Experiment Station data are presented from three years' experiments at the Caldwell Substation on the use of artificial heat in stock and poultry water.

Insulated common storage for apples, E. R. GROSS (*New Jersey Stas. Circ. 301 (1934), pp. 4, fig. 1*).—Practical information is given on the subject, together with a detailed drawing of the wall construction.

Ventilation of crop storages and cow stalls [trans. title], MATSCHINSKY (*Gsndhts. Ingen., 56 (1933), No. 49, pp. 582, 583, figs. 4*).—Ventilation apparatus is described and data presented briefly for use in the design of air intakes and outtakes.

Public health standards for the construction of milk houses and milking barns, H. B. WALKER, J. D. LONG, H. L. BELTON, ET AL. (*Calif. Univ., Agr. Ext. Serv., Agr. Engin. Inform. Ser. No. 5 (1933), pp. 14*).—These standards which are based on investigations conducted by the California Experiment Station, constitute a minimum construction code for buildings that are to be used in the production of market milk and cream in California. They deal with those factors relating to the location, design, and construction of the buildings which either directly or indirectly influence the purity of the product.

Attention is drawn to the fact that a series of dairy building plans and specifications have been prepared to meet these standards and are available from the station.

Determining tonnage of hay in stacks, R. L. ADAMS (*California Sta. Bul. 570 (1934), pp. 26, figs. 2*).—The results of a study conducted in cooperation with the U.S.D.A. Bureau of Agricultural Economics are reported in which more than 1,000 measurements of 563 stacks of hay were made and final weights determined of 364 of these stacks in order to check the accuracy of prevailing methods of estimating the tonnage of haystacks.

A study of the quartermaster and Frye-Bruhn rules, the two principally used in California, indicates that on an average they will give results within 99 and 88 percent, respectively, of the actual volume of stacks. Results obtained with the quartermaster rule, however, may be in error as much as 0.1 to 23.8 percent, and with the Frye-Bruhn rule from 5.4 to 20.8 percent of the actual volume of stacks.

The decimal rule, developed during the course of this investigation, is a refinement of the Frye-Bruhn rule, and for measuring square, flat-topped stacks is expressed by the formula $V=[(0.56\times O)-(0.55\times W)W]\ L$, in which O is the measurement of the over, W the width, and L the length of the stack. When stacks are measured in feet, to the nearest half foot, the results obtained by use of this formula give close approximations of the actual volume of stacks.

It was found that the volume of most stacks decreases steadily with aging, but the rate of decrease is not uniform because of the factors of kind of hay, maturity when cut, moisture content when stacked, amount and kinds of weeds, height of stack, method of stacking, rapidity of drying hay in stack (influenced by size and shape of stack and atmospheric conditions), and rainfall. On an average the rate of shrinkage was found to be 8.3 percent from 1 to 2 mo. after stacking, 7.9 from 2 to 3 mo., 6.5 from 3 to 4 mo., 10.3 from 4 to 5 mo., 14.0 from 5 to 6–8 mo., 27.4 from 1 to 6–8 mo., and 20.7 percent from 2 to 6–8 mo. after stacking.

Stacks tend to shrink in height only, little change taking place in either width or length. Wide variation was found to exist in the number of cubic feet which comprise a ton of hay. The average cubic feet per ton for 139 stacks of grain and volunteer hay was found to be 666 cu. ft., with 696 cu. ft. for the greatest frequency group. The average cubic feet per ton for 225 stacks of alfalfa was found to be 448 cu. ft. Studies of various factors, however, show the difficulty of indicating any single figure likely to be acceptable for general use.

When a need arises for determining the contents of stacks by some formula, in lieu of weighing, if the measurements of width, over, and length are known and a figure indicative of the number of cubic feet per ton determined, then much of the task of calculating can be avoided by use of the basic tables presented. The tables and chart provide a means for quickly and easily determining (1) the cross-section area of the stack, (2) volume, and (3) tonnage.

Suggestions to guide in measuring stacks stress the necessity of building stacks as evenly as possible, and the exercising of care in taking the required measurements.

The final conclusion is that there is no entirely satisfactory substitute for weighing, but when reliance must be placed on the use of some formula then the decimal rule is advocated as a means of determining volume. From this determination the number of tons can be ascertained once a figure has been reached indicative of the number of cubic feet comprising a ton of hay. Aids designed to assist in the calculating of the cubical contents of stacks by this method eliminate the necessity of laborious calculations.

AGRICULTURAL ECONOMICS

The American farm problem: A selected list of books and pamphlets on the economic status of the farmer and measures for his relief since 1920 (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 52 (1934), pp. 13+[4]*).—This is a mimeographed selected list.

[Investigations in agricultural economics by the Ohio Station, 1932–33] (*Ohio Sta. Bul. 532 (1934), pp. 81–85*).—Results of investigations not previously noted are reported in tabular form, including data by V. R. Wertz showing the estimated tonnage of commercial feeds sold in Ohio each year 1929–32; by C. W. Hauck showing the average percentage of perfection of samples of staple fruits and vegetables purchased from 32 chain and 68 independent stores in Columbus, and the relation between average percentage of perfection and retail prices for 100 samples of potatoes purchased; by C. G. McBride and R. W. Sherman showing the number of cream stations and patrons for 18 churning points in southwestern Ohio and the average distance each churning point was from its stations; by G. F. Henning showing the number and percentage of trucks owned from January to August 1932, inclusive, by individuals and corporations in the city and in the country in Crawford, Logan, Preble, and Franklin Counties; and by H. R. Moore showing the amount of tax levied in Ohio on real estate, public utility property, tangible personal property, and intangible personal property before (1930) and after (1932) the passage of the classified property tax act.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 78–82, fig. 1*).—Included are an article on The Origin of Livestock and Distance Transported by Truck to Cleveland from Ohio, by G. F. Henning, (pp. 78–81), in which the data previously noted for 1922 and 1928 (E.S.R., 62, p. 183) and data for 1932 are included in tables showing by 10-mile zones the number and percentage of cattle, calves, hogs, and sheep trucked to Cleveland during January, April, July, and October 1932, and during October 1922, 1928, and 1932; and Index Number of Production, Prices, and Income by J. I. Falconer (p. 82), showing in tabular form the indexes of United States wholesale prices, all commodities; weekly earnings, New York State factory workers; United States prices paid by farmers for commodities; United States farm products prices; Ohio farm wages; Ohio farm real estate prices; Ohio farm products prices; and Ohio cash income from sale of farm products, by years, 1913-33, inclusive, and by months for 1932 and 1933.

Current farm economics, Oklahoma [April 1934] (*Oklahoma Sta., Cur. Farm Econ., 7 (1934), No. 2, pp. 17–36, figs. 5*).—Included are statements regarding the general agricultural situation by R. A. Ballinger, the dairy situation by E. L. McBride, sheep and wool by Ballinger, hogs by P. Nelson, and the usual tables of indexes of prices and purchasing power of Oklahoma farm products. Other articles are included as follows: A Permanent System of Credit for Agriculture, by L. S. Ellis; Effect of Business Conditions on Agricultural Prosperity, by M. M. Blair; Trends in the Number and Value of Livestock on Oklahoma Farms, by P. H. Stephens; and Harvesting of Cotton in Oklahoma by Snapping, by C. C. McWhorter.

The land problem: Proceedings of the Social Weeks of Canada, Rimouski, Quebec, 1933 (*Le Problème de la terre. Comptes rendus des Semaines Sociales du Canada, XII. session, Rimouski, 1933. Montreal: Sec. Semaines Soc. Canada, 1933, pp. 352*).—Included are the following lectures and reports of conferences at the twelfth session of the Social Weeks of Canada held at Rimouski August 13–18, 1933: Agriculture, the Economic Base of a Nation, by E. Beaudoin (pp. 27–52); Agricultural Experimentation, by J. A. Sainte-Marie (pp. 53–60); Classification of Soils, by A. Scott (pp. 61–77); Vegetable Production, by J. N. Albert (pp. 78–86); Animal Production, by S. J. Chagnon (pp. 87–95); The Role of Agronomy, by L. de G. Fortin (pp. 96–125); Domestic Arts, by G. Bouchard (pp. 126–142); Agriculture and

Exchange, by C. Gagné (pp. 143–155); Agriculture and Credit, by C. Vaillancourt (pp. 156–169); Secondary Agricultural Instruction, by J. C. Allard (pp. 170–179); The Establishment of Sons of Cultivators, by H. Bois (pp. 180–195); The Tilled and Tillable Areas of the Province (Quebec), by E. Gagné (pp. 196–211); Colonization Work, by E. Minville (pp. 212–238); Professional Organization of Catholic Cultivators, by A. Belzile (pp. 239–253); The Church and the Land, by P. Perrier and M. Dupré (pp. 254–272); the Field of Education, by C. J. Magnan and Villeneuve (pp. 273–290); Family Agriculture and Large Scale Agriculture, by A. Rioux and E. Lapointe (pp. 302–326); and The Continuation of the Canadian French and the Land, by L. Groulx and Courchesne (pp. 327–349).

Changing food habits in relation to land utilization in the United States, G. L. Jordan (*Abs. Thesis, Univ. Ill., Urbana, 1933, pp.* [2]+*42*).—This is an abstract of a doctorate thesis. The study had for its objects "(1) to determine the extent, if any, of the relation between changes in food habits of people, particularly by those of the United States, and the uses to which agricultural land has been put in the United States; and (2) to make an estimate, based upon past and present tendencies, of the probable trends in the acreage requirements for the production of foodstuffs in the United States during the next quarter of a century as the result of changing food habits."

It discussed the changes from 1909 to 1923–27 in the per capita consumption of foodstuffs in the United States, the probable trends in such consumption, the changes in and post-war food habits in selected foreign countries, foreign competition in the production of important foodstuffs, the trends and possibilities of expansion in the production of the principal foodstuffs, and the effects of domestic and foreign changes in food habits upon the demand for agricultural land in the United States and upon Illinois agriculture.

Unused lands in Louisiana, C. T. Dowell (*Louisiana Sta. Circ. 6* (*1934*), *pp. 8*).—Using results of research work of the station as a basis, the possible uses for unused lands of the State are discussed.

Recreational use of northern Michigan cut-over lands, W. O. Hedrick (*Michigan Sta. Spec. Bul. 247* (*1934*), *pp. 63, figs. 7*).—This is a study of the benefits of cut-over lands of the northern part of the Lower Michigan Peninsula derived from recreational agencies. It is based chiefly on data from assessment sheets; resort plats; a questionnaire covering origin, present condition, and control methods sent to summer resorts; and field work of the author.

The past utilization of the cut-over lands, past and present remedial efforts, surveys and studies, the physical climatical features, accessibility of, and types and distribution of recreational facilities in the area are described. Special consideration is given to summer resorts, the location, types of visitors, management and control structure, and the successes and failures being discussed. The present and possible benefits to the area of recreational facilities through increased tax returns, increased demand for local products and services, etc., are discussed.

Some preliminary results of a study of part-time farms in Chemung and Tompkins Counties, New York, 1932, K. Hood (*Ithaca: N.Y. State Col. Agr., 1933, pp.* [3]+*33, fig. 1*).—Records for the year ended June 1, 1932, were obtained from 249 part-time farmers in Chemung County and 18 in Tompkins County. Tables and charts show the age, occupation, education, net worth, etc., of the farmers, the extent of their farming operations, their income and expenses, operator's earnings, factors affecting earnings, value of farm products furnished for home use, etc. The amount of poor relief received by the

farmers and the factors influencing the amount, the factors to be considered in purchasing a part-time farm, the methods of financing such purchase and the cost of building houses, and the relative costs and advantages and disadvantages of living in the city and country are discussed.

The agricultural situation [in Canada] (*Ottawa: Canada Dept. Agr. and Dept. Trade and Com., 1934 pp. 43*).—This is the first of a series of annual reports planned by the Departments of Agriculture and Trade and Commerce of Canada. "It aims to present in concise form a review of domestic and foreign demand and competition and to analyze the factors affecting the supply of, and the demand for, particular farm products."

World resources and industries, E. W. ZIMMERMANN (*New York: Harper & Bros., 1933, pp. XIX+842, pls. 3, figs. 154*).—This is "a functional appraisal of the availability of agricultural and industrial resources." The four parts deal with background and perspectives, the resources of agriculture and their utilization, the resources of industry and their utilization, and foreground and prospectives.

"From the start the relativity and functional nature of resources are stressed as they develop from constantly changing want patterns, dimly conceived social objectives, and disconcertedly dynamic arts. Resources viewed in that light are the living environment in the service of man. Energy rather than matter supplies the living force. Hence energy is placed in the center of the stage. It dominates the scene, determining the manner of land utilization, the size, shape, and architecture of the cultural superstructure which man raises on the foundations of his natural environment, vitally affecting even man's attitude toward population increase and hence the all-important man-land ratio.

"In this discussion the shift from reliance on muscular energy to an increasing dependence on machine power is of strategic importance. It dictates the entire lay-out of the body of the book, for it reveals the world of resources as made up of two major patterns or categories—the ancient culture pattern of animate energy, of organic, living substance, in short, of agricultural or vegetable civilization on the one hand and the modern culture pattern of inanimate energy, of dead matter, especially the metals, in short, of machine or industrial civilization on the other."

The settlement of the unemployed on the land in Austria, F. RAGER (*Internatl. Labor Off., Geneva, Internatl. Labor Rev., 29 (1934), No. 3, pp. 384–397*).—The history of the movement, some of the results of settlement schemes, voluntary labor service in the schemes, and the conditions for the development of the movement are described.

The regulation of collective employment relations in agriculture in Italy, H. E. BRUNO BIAGI (*Internatl. Labor Off., Geneva, Internatl. Labor Rev., 29 (1934), No. 3, pp. 309–319*).—"The author examines the scope of collective agreements in Italian agriculture and the questions dealt with in the agreements concluded, and points out that even the difficult question of social insurance is solved within the framework of this system. Finally he shows how the scope of collective agreements has been extended from labor questions proper to various forms of land cultivation, and how latterly the system has been applied to the regulation of the important question of share farming."

Prospects for agricultural recovery.—VI, Farm mortgage policy, W. G. MURRAY (*Iowa Sta. Bul. 315 (1934), pp. 129–158, figs. 4*).—This bulletin is the sixth of the series previously noted (E.S.R., 71, p. 117). The reduction of indebtedness through refinancing, scaling debts, and foreclosures; the foreclosure policy from the standpoint of creditor and borrower; better appraisals; com-

missions; and variable payments on principal, including the adjustment of second mortgages to farm income or production, are discussed.

Maps show by townships the percentages of farm land in Iowa owned by corporations and average value per acre of land and buildings. Tables show by years, or by selected years, 1915–33, inclusive, (1) estimated mortgage holdings of principal types of lenders, March 1934; (2) the estimated farm-mortgage indebtedness of the State, the mortgage indebtedness of land mortgaged, average debt per acre mortgaged, percentages of debt secured by first and junior mortgages, and reasons for payment and cancellation of mortgages in 13 townships of the State; (3) number of foreclosures and deficiency judgments by different types of lenders, and acreages involved in foreclosures by types of lenders in 16 counties; and (4) for each county of the State the acreage held by corporations, its percentage of the total acreage, and the percentages held by different types of companies.

Production costs and returns from major Salt River Valley field crops, 1928–1930, R. L. MATLOCK and S. P. CLARK (*Arizona Sta. Bul. 146 (1934), pp. 57, figs. 5*).—This is a continuation of the study for which the results for 1928 have been noted (E.S.R., 66, p. 477). Tables show (1) for each farm studied the acreage and gross returns; expenses, by items; and net returns for capital and management per acre for Pima cotton, upland cotton, alfalfa, and wheat for 1929–30, and for barley, and Hegari sorghum for grain and for silage, 1930; and (2) for Pima cotton, upland cotton, wheat, and alfalfa the average 1928–30 man, horse, and tractor hours required per acre for different operations, and the costs at 1928–30 and 1933 rates. The results for 1929–30 and the averages for 1928–30 are discussed and comparison made of the several crops.

The net returns per acre for capital and management for the three years 1928, 1929, and 1930, respectively, were: Pima cotton, $71,43, $43.72, and $20.12; upland cotton, $45.41, $35.62, and $10.64; alfalfa, $36.67, $41.25, and $24.20; and wheat, $20.84, $21.68, and $17.49. The average returns in 1930 for barley were $5.50 per acre and for Hegari sorghum $6.25.

Production of crops and livestock on the Newlands project in 1933, F. B. HEADLEY and C. VENSTROM (*Nevada Sta. Bul. 134 (1934), pp. 8, fig. 1*).—This is the fifth bulletin of the series previously noted (E.S.R., 69, p. 612). Using census reports of the U.S. Bureau of Reclamation and data furnished by the Southern Pacific Railroad and several creameries, tables are included and discussed showing for 1933, 1932, and in some cases prior years or periods, the acreages in farms, irrigable, irrigated, and harvested; number of farms by tenure; average acreage per operated farm; population by classes; acreages of different crops harvested; acreages of minor crops, 1933; acreages in alfalfa and production; car-lot movements of alfalfa and different kinds of livestock to and from the project; average production and yield of small grains; and acreage and value of production of farm gardens and orchards.

Production trends in the United States since 1870, A. F. BURNS (*Natl. Bur. Econ. Res. [New York] Pub. 23 (1934), pp. XXXII+363, figs. 21*).—In the six chapters production statistics and the measurement and analysis of production trends are discussed, comparisons are made among the rates of growth in different branches of industry, constants which measure the retardation in growth of industry are derived, the trend cycles are measured, and the growth of total production is discussed. Appendixes include supporting statistical data, a list of the sources of the production data, and notes on measures for production series.

A summation of the problem and findings, by W. C. Mitchell, is included.

Raspberry and strawberry production trends in Minnesota, W. H. Alderman, J. D. Winter, and R. W. Cox (*Minnesota Sta. Bul. 305 (1934), pp. 16, figs. 5*).—Using data obtained by questionnaire from 309 commercial producers of red raspberries and 250 producers of strawberries, the 1933 acreages and production, and the estimated acreages and production in 1934 and 1935, local sales, shipments, the growers' opinions of local marketing conditions, leading varieties produced, and size and type of containers used, are discussed.

The world wheat situation, 1932–33: A review of the crop year, M. K. Bennnett and H. C. Farnsworth (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *10* (*1933*), *No. 3, pp.* [*2*]+*71–142, figs. 27*).—"World wheat supplies were again superabundant in 1932–33, despite short crops in the Danube basin and the United States. Importing Europe harvested a record crop, and import restrictions were tighter than ever before; consequently imports were the smallest since 1917–18, and well below the pre-war average. Ex-European imports, however, were sizeable, though only because of heavy Chinese takings. Italy, Germany, and Japan were conspicuously small net importers. The United States, again prominent as a country willing and able to hold stocks, exported less wheat and flour than in any year since 1868–69.

"World wheat prices (in gold) fluctuated around a new low average level, in spite of an advance induced toward the close of the year by unfavorable prospects for the North American crops of 1933. The impact of low prices in all of the major exporting countries, however, was softened by depreciation of domestic currencies, including the United States dollar. A tremendous wave of speculative enthusiasm, based on the unfavorable new-crop prospects and inflationary developments, more than doubled the price of wheat futures at Chicago between March 23 and July 17, 1933; but a spectacular crash ensued. In some of the principal importing countries of continental Europe, the crops of 1932 were so large that increased stringency of import controls failed to prevent sharp reductions in wheat prices.

"World disappearance was smaller than in the two preceding years, with conspicuous reductions of wheat consumption for feed in the United States, and for food in Rumania, Yugoslavia, Poland, Germany, Italy, and Japan. Stocks were built up during the year, and stood at a new high level at its close. The excess—roughly 70 percent above normal—was again mainly in North America."

Survey of the wheat situation, April to August 1933, M. K. Bennett and H. C. Farnsworth (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *9* (*1933*), *No. 10, pp.* [*2*]+*351–387, figs. 7*).—It is stated that a tremendous wave of speculative enthusiasm more than doubled the price of wheat futures at Chicago between April and July 17, 1933. A persistent and initially very steep decline followed. By early September wheat prices at leading futures markets, in terms of gold, had fallen almost to the level of early April; and the net gain of April-August in Chicago prices, as quoted, corresponded closely to the amount of depreciation of the dollar.

Favorable new-crop prospects in Europe and the pressure of huge world stocks of old-crop wheat—the highest on record—were dominant factors in restraining the advance and forcing the decline. Barriers to international trade in wheat were maintained or increased in rigor, though an international agreement concluded late in August may tend to relax import controls later.

The outlook for the crop year 1933-34 includes a very small movement of wheat and flour in international trade—probably only 575 million bushels. The United States again will export little, though perhaps more than in 1932–33.

World wheat survey and outlook, January 1934, M. K. Bennett, H. C. Farnsworth, and H. Working (*Wheat Studies, Food Res. Inst.* [*Stanford*

Univ.], *10* (*1934*), *No. 4, pp.* [*2*]+*143–182, figs. 11*).—The 1933 world wheat crop ex-Russia was small, but appeared to be around 190 million bushels larger than it did last September. Supplies were particularly heavy in continental Europe, where the rigor of import restrictions has not yet been abated. The volume of international trade in August-December was strikingly small. Chicago prices remained far above Liverpool prices, and the very limited United States exports consisted chiefly of flour ground from Canadian wheat plus some subsidized shipments from the Pacific Northwest.

International trade for the crop year seemed likely not to exceed 550 million bushels. World wheat disappearance may somewhat exceed that of 1932–33 despite substantial reduction of mill grindings and feed use in the United States. World disappearance will probably exceed production, and world stocks may be roughly 120 million bushels smaller at the end of the crop year than at the beginning; but the level of stocks will remain more than 300 million bushels above normal. North American stocks will be reduced, but Southern Hemisphere stocks will be increased if exports are as allocated under the International Wheat Agreement.

Price leadership and interaction among major wheat futures market, R. D. Calkins (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *10* (*1933*), *No. 2, pp.* [*2*]+*35–70, pls. 7, figs. 2*).—Herein are presented results of a detailed investigation of price leadership and interaction among Chicago, Winnipeg, and Liverpool for the seven years 1924-31 which indicate a need for revision of many opinions which are widely held.

From an analysis of initial changes and responses, it is found that Chicago and Winnipeg "originate" approximately two-thirds of all price movements and Liverpool only about one third. It appears that when prices in North American markets are above export parity their movements remain closely related to price movements in other markets. The maintenance of prices at such heights seems to have no significant effect upon the price interaction between markets or on the correspondence of Liverpool and North American price changes over brief intervals.

Price relations between May and new-crop wheat futures at Chicago since 1885, H. Working (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *10* (*1934*), *No. 5, pp.* [*2*]+*183–228*+[*2*], *figs. 16*).—Previous investigations of price relations between July and September wheat futures at Chicago are here continued in a study of relations between the May and July futures, supplemented by extensions of the previous study and a broad consideration of price relations among the May, July, and September futures.

Interpretations of the domestic wheat supply position are the chief influences affecting price spreads between old-crop and new-crop futures and often the chief influences in the price movements of May wheat itself. Corners and squeezes, and perhaps other peculiarly speculative developments, have affected or largely set aside these interpretations more often and to a greater degree than has previously been demonstrated.

The common impression that wheat prices tend to suffer a decline in March, followed by a recovery in April, is in large part justified but contains an important error. The common downward trend in March seems to reflect a real general tendency, but the April rise has rarely occurred except after failure of the March decline and has usually followed such failure.

Competitive position of lard in the market of animal and vegetable fats and oils, R. Schickele and T. W. Schultz (*Iowa Sta. Res. Bul. 171* (*1934*), *pp. 125–220, figs. 14*).—"The purpose of this study is to analyze the production characteristics and price structure of lard and to determine the position it holds in competition with other animal and vegetable fats and oils."

The volume of lard production in the United States and in Iowa; the flexibility of the output; the comparative value of pork, lard, and hogs; the various forms of lard and their uses; the trends in the consumption of lard and other fatty foods; the production, physical properties, consumption, and price movements; oils used in lard substitutes; the relation of prices of such substitutes to lard; influence of margarine on lard and butter; the competitive position of cottonseed oil relative to lard and other oils, including the interchangeability of oils, and the food and soap oil markets of the United States; lard exports relative to lard production, domestic consumption, and lard exports; export movements of lard and pork; and the foreign markets for American lard are discussed.

Foreign production, trade, and government aid in the raisin and currant industry, W. Bauer (*California Sta. Bul. 566 (1933), pp. 142*).—A study in cooperation with the U.S.D.A. Bureau of Agricultural Economics is made of the nature, method, and results of government aid to the raisin and currant industry in foreign countries with a view to appraising the influence such measures have had and are likely to have upon world raisin production and trade. Tables are included and discussed showing the volume and trends of production, importations, and consumption of raisins and currants in the principal countries. More detailed study is made for the principal producing countries of the production trends, exports and export markets, development of and measures for government aid to the industries, and the past and probable future effects of such measures.

An economic study of the marketing of certain perishable farm products in Albany, New York, W. J. Hopper (*[New York] Cornell Sta. Bul. 585 (1934), pp. 61, figs. 16*).—"The purposes of this study were: (1) To learn the nature of the business transacted on the Albany Public Market, the origin and disposal of the produce exchanged, and the efficiency of the market as it is now operated; (2) to determine the role that the public market and other retail agencies fill in the distribution of perishable farm produce in Albany and its environs; (3) to obtain data which may suggest methods of lowering the costs of marketing; (4) to obtain facts which may help to increase the consumption of New York farm products." The report is divided into three main phases: "(1) An analysis of the wholesale buying and selling on the Albany Public Market; of the adequacy of the present market facilities, and its regional aspect. (2) An analysis of the retailing of perishable produce by city peddlers and by chain and independent retail stores. (3) An analysis of the data obtained from wholesale and jobbing produce firms and records of the nature and origin of carloads of perishable produce unloaded in Albany during 1930."

Records were obtained from 288 of the 1,047 growers and 60 of the 147 intercity truckers doing business on the market, from 206 of the 483 independent retail stores, and the 113 chain grocery stores in the city of Albany, and from the railroad companies regarding car-lot unloads in Albany. The data for the railroad companies were for the calendar year 1930, and those from the other sources for the year ended September 1, 1930.

The Albany market is described, and tables are presented and discussed showing the volume of sales of vegetables, fruits, eggs, berries, poultry, flowers, meats, and miscellaneous by growers, trucker-dealers, and market-hucksters, and the sales to intercity truckers, consumers, retail stores, city peddlers, wholesale and retail jobbers, and market hucksters.

The analysis for growers shows the counties and townships represented; streets used in coming and going; changes in methods of transportation from 1925 to 1930; annual volume of sales; seasonal sales of different commodities;

distances loads were transported; value of loads and the effects on costs; acreage, value, and sales of different commodities; and growers' suggestions as to possible improvements in the Albany market. Trucker-dealer business on the market, the potential supply of fruits and vegetables, car-lot shipments from neighboring counties, and the intercity trucker as a factor on the market are discussed. The analysis of the retail trade in Albany in perishable products includes tables with discussions showing the sources of supply and sales in the independent and chain stores. The wholesaling and jobbing business and the car-lot unloads of fruits, vegetables, eggs, and poultry are also discussed.

More than 80 percent of the sales on the market were made by growers and about 20 percent by dealers. Almost 50 percent of the sales were to intercity truckers and about 17 percent each to consumers, city peddlers, and retail stores. Of the sales of independent retail stores, 50.7 percent of those of vegetables, 54.5 percent of those of fresh fruits other than bananas and citrus fruits, 52 percent of those of eggs, and 34 percent of those of poultry were produced in New York State. In the chain grocery stores, 16.1 percent of the vegetables, 17.6 percent of the fresh fruits, except bananas and citrus fruits, and 4 percent of the eggs were produced in New York State. All poultry was shipped in from without the State.

The need of enlargement and relocation of the market and the possibility of increase in the sales of commodities produced in New York with the better facilities are discussed.

Some facts concerning the marketing of eastern grapes, I, II, M. P. RASMUSSEN (*N.Y. Agr. Col. (Cornell) Ext. Buls. 275 (1933), pp. 42, figs. 7; 276, pp. 69, figs. 27*).—This study was made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., and the Federal Farm Board.

I. *Competition, distribution, and wholesale marketing.*—This bulletin discusses the competition of grapes with other fresh fruits; distribution of grapes from the more important producing areas of the United States; freight rates from different areas; the grading, marketing, and costs of selling at country points in New York; and the receipts, marketing methods, and costs and margins in marketing in New York grapes at wholesale in Philadelphia and Chicago.

II. *Retail distribution and consumer demand.*—Data regarding retail sales of eastern and California grapes during the 1928–29 season were obtained from 300 retail food stores or outlets in Philadelphia, 273 in Cincinnati, and 321 in Chicago. The types of food outlets merchandizing grapes, proportion of sales through different types of such outlets, quantity of grapes sold by different types of stores, proportion of consumers using eastern grapes, factors affecting sales of eastern grapes, size of purchases of grapes, consumer preference as to size of containers, prices of eastern and California grapes, spoilage, advertising of eastern grapes, etc., are discussed.

The data regarding consumer demand for grapes were obtained from 674 Philadelphia, 809 Cincinnati, and 896 Chicago families. They are analyzed to show the use or nonuse of eastern grapes, per family and per capita consumption, uses made of eastern grapes, and the effects of nationality, income, number of wage earners, occupation of chief wage earner, size of family, and number of adults and children in family on the use of eastern grapes for jelly, juice, and table. The sources of consumer supply, sizes of containers preferred for grapes used for different purposes, varieties of grapes preferred, consumer attitudes toward eastern grapes, etc., are discussed.

Report of Tobacco Inquiry Committee, 1933, [North Queensland] (*Canberra: Govt., 1933, pp. 46*).—This is a report of the committee appointed by the Prime Minister of Australia on July 7, 1933, to investigate and report

on the following phases of the position of the tobacco industry in North Queensland: "(1) The present costs of production of tobacco leaf in the related districts; (2) the reasons for the excess (if any) of existing production costs over the normal costs of efficient production; (3) the allegations made by the North Queensland Tobacco Growers' Association that tobacco manufacturers were paying unfair prices for the 1932–33 season's production, and/or were refusing to buy good, usable leaf; [and] (4) the obstacles to the efficient production of tobacco leaf in North Queensland."

Emergency hog marketing program (*U.S. Senate, 73. Cong., 2. Sess., Doc. 140 (1934), pp. IV+44, fig. 1*).—This is a report prepared by the Agricultural Adjustment Administration and submitted by the Secretary of Agriculture in response to S.Res. 123 of January 8, 1934, on the emergency hog-marketing program conducted from August 23 to October 7, 1933, with respect to the total number of animals purchased, live weight of same, total dollars paid, yield and disposition of products, price trends at specified markets before, during, and after the buying campaign, and an opinion based on available data with respect to hog-price movements during October, November, and December.

Livestock shipping associations in Minnesota, E. C. JOHNSON and J. B. MCNULTY (*Minnesota Sta. Bul. 302 (1934), pp. 27, figs. 2*).—The changes in the number of associations, the volume of business handled per association, and the amounts paid managers from 1919 to 1931, the gross receipts of 106 associations at terminal markets in 1930, the relation of volume of business to manager's salary, other local expenses, good business practices used, and cost per 100 lb. of stock handled for manager's services are tabulated and discussed. Using data obtained for 1929–31, tables show for cattle, calves, hogs, and sheep the average percentage of shrinkage, and the relation of distance, season, and distance and season combined to percentage of shrinkage. When and where to sell livestock are discussed, with tables showing the average prices and the average receipts of top hogs, and average top price for good to choice veal calves at the South St. Paul market on each day of the week, 1927–31. Among other subjects discussed are prorating shipments, effect of trucking on livestock shipping associations, and practices of associations using trucks.

An economic analysis of cheese factory operations in Ontario (*Ottawa: Dominion Dept. Agr. and Ontario Dept. Agr., 1933, pp. 44, figs. 7*).—This analysis, prepared by the Dominion Department of Agriculture in cooperation with the Ontario Department of Agriculture, discusses the development, location, ownership, operation, etc., of cheese factories. Analysis is made of the costs of manufacturing cheese, contract rates and amounts received by cheese makers, quality of cheese made and prices received, methods of paying for milk, costs of hauling milk, etc.

Fifteenth Census of the United States, 1930: Cooperatives as a factor in the distribution of agricultural commodities, C. D. BOHANNAN (*Washington: U.S. Bur. of the Census, 1934, pp. II+65*).—This is the first of a series of reports and is based principally on data secured in the first Census of Distribution, taken by the U.S. Bureau of the Census in 1930.

Tables included and analyzed show for 1929 (1) the number, membership, total volume of business, retail sales, number of employees, salaries and wages, and expenses of cooperative marketing associations, by geographic divisions, States, and counties; (2) by States, the same data and the number, sales, and expenses, by size of business, for grain, livestock, cotton, egg and poultry, dairy products, fruit and vegetable, and other marketing cooperatives; and (3) for cooperative buying associations and cooperative stores, by States and divi-

sions, and number, total volume of business, number of employees, salaries and wages, and expenses.

Crops and markets, [April 1934] (*U.S. Dept. Agr., Crops and Markets, 11 (1934), No. 4, pp. 105–144, figs. 3*).—Included are tables, charts, summaries, reports, estimates, etc., of the usual types, and an article on Farm Population, January 1934, with tables showing the population January 1, 1910, and each year, 1920–34, inclusive, the changes in population, movements to and from farms, and changes by geographic divisions, 1932–34, inclusive.

Annual index numbers of farm prices, California, 1910–1933, H. J. Stover (*California Sta. Bul. 569 (1934), pp. 71, figs. 20*).—The index number series presented is of the "weighted aggregative" type, including the following 35 commodities, from which between 85 and 90 percent of the gross cash income of the farmers of the State is derived: Beef cattle, veal calves, hogs, sheep, lambs, milk, milk fat, butter, eggs, chickens, wool, horses, barley, wheat, oats, corn, hay, alfalfa, cotton, potatoes, beans, oranges, lemons, apples, rice, sugar beets, grapes, peaches, pears, apricots, cherries, raisins, prunes, walnuts, and almonds. The method of constructing the series is described and discussed.

Tables and charts show (1) the monthly and annual weighted average of monthly prices for the first 24 commodities listed above for the years 1910–33, and the estimated seasonal prices for cotton, 1910–21, and for the other 11 commodities for the period 1910-33; (2) the annual index numbers for all commodities, all livestock and livestock products, meat animals, dairy products, poultry products, all crops, grains, field crops other than grains, and fruits for the crop (July–June) years 1910–32 and calendar years 1910 to 1933, inclusive, using July 1910 to June 1915, July 1924 to June 1929, 1910–14, and 1924–28 as base periods; (3) the annual relatives of unweighted averages of monthly prices of the different commodities, July 1, 1910, to June 1933 (1924–28=100); and (4) comparisons of the index numbers of California prices and those of farm prices in the United States and other States.

RURAL SOCIOLOGY

Population movement, F. G. Beck (*Ohio Sta. Bul. 532 (1934), p. 85*).—A table estimates the total number of children and the number of girls that will be borne by each 100 Ohio native white, foreign-born white, and colored rural and urban women, assuming that the birth and death rates remain as in 1930.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

List of technical workers in the Department of Agriculture, and outline of Department functions, 1933 (*U.S. Dept. Agr., Misc. Pub. 177 (1933), pp. V+125*).—This is the usual annual list (E.S.R., 66, p. 88) giving the technical workers of the Department, by bureau divisions and sections, and describing briefly the principal functions of the different branches of the Department.

Yesterdays at Massachusetts State College, 1863–1933, F. P. Rand (*[Amherst]: Assoc. Alumni Mass. State Col., 1933, pp. VII+245, pls. [16]*).—This history depicts outstanding episodes in 44 chapters. A chronological supplement, a list of sources, and other bibliographical material are appended.

FOODS—HUMAN NUTRITION

Report of the 1932–33 committee on the standardization of laboratory baking, W. F. Geddes et al. (*Cereal Chem., 10 (1933), No. 6, pp. 531–620, figs. 4*).—This annual report (E.S.R., 69, p. 461) consists chiefly of sub-

committee reports on various problems as follows: *Studies on the A.A.C.C. Standard Baking Test as Applied to the Testing of Whole Wheat Flours*, by R. T. Bohn and F. D. Machon (pp. 533–544); Scoring Crumb Grain, by C. H. Bailey and M. C. Markley (pp. 545–547) (see below); A Mechanical Method for the Determination of Absorption in Bread Doughs, by C. C. Fifield (pp. 547–554) (see page 417); Variability in Experimental Baking—III, The Influence of Experimental Milling in Evaluating Wheat Strength, by W. F. Geddes, H. N. Bergsteinnson, and S. T. Hadley (pp. 555–559), and IV, Studies on Mixing, Sheeting Rolls, Pan Shape, and 50 and 25 Gram Formulas, by W. F. Geddes and L. D. Sibbitt (pp. 560–584); Molding Tests with Motor-Driven Laboratory Dough Sheeter, by J. Freilich (pp. 585–588); Diastatic Supplements for the A.A.C.C. Baking Test, by Q. Landis and C. N. Frey (pp. 588–592); Some Relationships between Sugar, Diastatic Malt Extract, and Potassium Bromate in the Baking Formula (pp. 593–598) and The Effect of Ammonium Phosphate on Loaf Volume (pp. 599–601), both by R. K. Larmour and S. F. Brockington; Comparison of Various Baking Formulas Used in Testing Wheat Quality for the Plant-Breeder, by R. K. Larmour, W. F. Geddes, and A. G. O. Whiteside (pp. 601–604); Further Experiments with the "Short Fermentation Method" in Laboratory Test Baking, by R. M. Sandstedt and M. J. Blish (pp. 605–612) (see page 417); Variability in Experimental Baking—I, Effect of Mechanical Mixing Devices, Time of Dividing Doughs, and Quantity of Dough Mixed on Loaf Characteristics, and II, Yeast Variability, by R. Weaver, P. Talbott, and D. A. Coleman (pp. 612–618) (see page 417); and The Wheat-Meal Fermentation Time Test, By H. K. Wilson, M. C. Markley, and C. H. Bailey (pp. 619, 620) (see page 418).

Scoring crumb grain, C. H. Bailey and M. C. Markley (*Cereal Chem., 10 (1933), No. 6, pp. 545–547*).—This contribution from the Minnesota Experiment Station consists of (1) a study of the variability in bread crumb grain scoring when scores are assigned by different individuals and the correlatons between the scores thus assigned, and (2) a comparison of scores assigned with and without reference to bread standards prepared by the committee. The bread scored consisted of 13 samples, including loaves baked from 100 g of flour in standard baking pans, as well as commercial loaves. The standard loaves were numbered from 1 to 9 in order of increasing superiority, as judged by representatives of the committee and the laboratory supplying the specimens. The six experienced technicians conducting the tests were all from different laboratories.

On subjecting the scores to statistical analysis, it was found that the average coefficient of variation of scores assigned without standards was 9.56 and with standards 7.61. Inclusion of the reference standard reduced the variability substantially. Calculations of the coefficient of correlation r of each collaborator's score with every other collaborator's score, making a total of 15 combinations, gave a range in values of r from +0.767 to +0.952 for loaves scored without a standard and +0.703 to +0.948 for loaves scored against standards. The averages were +0.891 and +0.876, respectively.

"This study suggests the desirability of arranging for group collaborative studies of this sort with a view toward unifying the practices of different individuals and laboratories in scoring bread. While no mathematical proof of this contention is at hand, the subcommittee suspects that even better agreement might result if these six technicians, for example, were to work together in scoring crumb grain for a time. The same would probably apply in other groups. The use of such standards as have been employed here would undoubtedly contribute to the standardization of scoring practices."

Method of preserving bread for permanent grain judging standards, M. C. MARKLEY (*Cereal Chem., 11 (1934), No. 2, p. 200*).—To preserve bread to be used as standards in scoring crumb grain, as noted above, slices or halves of 100-g loaves are dipped in a solution composed of 1 part of glycerine, 2 parts of 40 percent formaldehyde, and 1 part of water by volume. After the bread has taken up the solution to saturation, which usually requires about 1 min. for the slices and 2 for the halves of small loaves, the samples are laid face down on a clean board in a closed space or cabinet and allowed to dry slowly for about 1 mo., after which they can be mounted behind glass in a picture frame and used in this manner as standards.

A mechanical method for the determination of absorption in bread doughs, C. C. FIFIELD (*Cereal Chem., 10 (1933), No. 6, pp. 547–554*).—A mechanical method devised by E. B. Working for determining the moisture absorption of the flour is described in this contribution from the Bureau of Plant Industry, U.S.D.A., and comparisons are reported of absorption tests conducted on various flours by the Working method and the usual tests employed in experimental baking. The mechanical method gave duplicate tests on the same sample checking within 0.4 percent and showing agreement on different days varying from 0.2 to 1.2 percent. The values were in all cases lower than those obtained with the customary method, and the differences between the two values were not constant even within the same classes of wheat flour. No changes in absorption of five commercially milled hard red spring wheat flours during 2½ months' storage under regular bakery storage conditions were detected by the mechanical method.

Further experiments with the "short fermentation method" in laboratory test baking, R. M. SANDSTEDT and M. J. BLISH (*Cereal Chem., 10 (1933), No. 6, pp. 605–612*).—A further study at the University of Nebraska of the short fermentation method proposed in the final report of the work of the A.A.C.C. baking research fellow (E.S.R., 68, p. 559) was made with a view to determining particularly (1) the behavior of experimentally milled flours when baked by the short method, and (2) the ability of the short method to register the maturing effect of the bleaching agents now used in the average commercial mill.

In regard to the first point, it was found advisable to add 1 percent of sugar to the experimentally milled flours to give results comparable to those with commercially milled flours when baked without sugar. Concerning the second point, it was concluded that the short method is of less value than the standard method, but that the discrepancy can be overcome by using an iodate differential test in the same way that the bromate test is used with the standard method. For the standard formula 0.5 mg of potassium iodate is recommended.

Variability in experimental baking.—I, Effect of mechanical mixing devices, time of dividing doughs, and quantity of dough mixed on loaf characteristics. II, Yeast variability, R. WEAVER, P. TALBOTT, and D. A. COLEMAN (*Cereal Chem., 10 (1933), No. 6, pp. 612–618*).—Data on the points studied in this contribution from the Bureau of Agricultural Economics, U.S.D.A., are assembled in tables dealing with the frequency distribution of differences in loaf volume results with the use of the Hobart-Swanson mixer as compared with the Hobart mixer with two dough hooks; frequency distribution of loaf volume data in a comparison of dividing the dough at the time of mixing with dividing after fermentation, using the Hobart-Swanson mixer; frequency distribution of differences in loaf volume results in comparison of 200-g doughs with 100-g doughs, using the Hobart-Swanson mixer;

and the effect of age and brand of yeast on loaf volume values from 50 replicate bakes, using first clear flour.

The wheat-meal fermentation time test, H. K. Wilson, M. C. Markley, and C. H. Bailey (*Cereal Chem., 10 (1933), No. 6, pp. 619, 620*).—In this contribution from the Minnesota Experiment Station, a comparison is reported of the data obtained by the wheat meal fermentation time test, as described by Cutler and Worzella,[2] with protein percentages and baking data for various spring and winter wheats. "The time test was not significantly correlated with protein percentage and loaf type. It probably was correlated significantly with loaf volume and strength score. There was more variation in the winter wheat group, which included semihard wheats as well as hard wheats, but the correlations with baking scores were of about the same magnitude as those of the spring wheats."

Report of the committee on methods of testing cake and biscuit flours, M. M. Brooke et al. (*Cereal Chem., 10 (1933), No. 6, pp. 622–641*).—This annual report (E. S. R., 69, p. 460) includes a brief report by the chairman (p. 622) and various subcommittee reports as follows: The Results of Bleaching Michigan Soft Winter Wheat Cake Flours by the Brabender Electric Bleaching Apparatus, by G. L. Alexander (pp. 623–626); Cake-Baking Method for Testing Soft Wheat Flours, by L. H. Bailey (pp. 627, 628) (see below); Testing Biscuit and Cracker Flour, by J. A. Dunn (pp. 628-631); Tentative Formula for Testing Cake Flour, by L. K. Track (pp. 632–634); and Tests for Biscuit and Self-Rising Flours, by H. G. Walter (pp. 635–641).

Cake-baking method for testing soft wheat flours, L. H. Bailey (*Cereal Chem., 10 (1933), No. 6, pp. 627, 628*).—In this contribution from the Bureau of Chemistry and Soils, U.S.D.A., a basic cake formula is presented showing slight variations from the one previously proposed (E.S.R., 69, p. 460) as a standard formula for testing the cake-baking value of flours. The procedure to be followed is outlined in considerable detail.

Tests for pie flours, A. A. Schaal (*Cereal Chem., 10 (1933), No. 6, pp. 621, 622*).—This is the first report of the A.A.C.C. committee on pie flours, formed to continue the work reported by Kress (E.S.R., 69, p. 460) as chairman of a subcommittee on pie flour tests of the committee on testing soft wheat flours.

The inorganic constituents of wheat and flour, B. Sullivan (*Cereal Chem., 10 (1933), No. 6, pp. 503–514*).—This is a compilation of information on the content of phosphorus, potassium, magnesium, calcium, sulfur, sodium, and chlorine and on the presence of rarer elements in wheat patent flour and bread. An extensive bibliography is appended.

The nutritive deficiencies of gelatin, H. D. Kruse, H. G. Day, and E. V. McCollum (*Amer. Jour. Hyg., 19 (1934), No. 1, pp. 260–269, fig. 1*).—In this reinvestigation of the problem, the possibility that a part of the nutritive inferiority of gelatin may be attributed to a deficiency of the dietary essential discovered by Rose et al. (E.S.R., 67, p. 339) was tested by using the monoamino acid fraction from casein as a supplement to gelatin (already supplemented with tyrosine, tryptophan, and cystine and in some instances with histidine) in feeding experiments on young rats on a diet considered to be adequate in other respects than protein.

On the diet containing all of the supplements with the monoamino acid fraction at a 5-percent level, the growth response was better than on any of the other combinations, comparing favorably with that on casein as the sole protein. The animals showing the best growth consumed in absolute amounts

[2] Jour. Amer. Soc. Agron., 23 (1931), No. 12, pp. 1000–1009, figs. 3.

somewhat more food than those showing inferior growth, but in terms of intake per gram gain in weight the food consumption was lower. Despite the excellent rate of growth renal lesions were found on autopsy, as was the case with all of the animals on gelatin diets.

Whether the monoamino acid fraction supplements the deficiency in gelatin through supplying Rose's unknown factor or a known monoamino acid, or both, has not been determined, but attention is called to previous studies by Jackson, Sommer, and Rose (E.S.R., 61, p. 89) showing that valine, leucine, and isoleucine, when added to gelatin along with tryptophan, tyrosine, cystine, and histidine, did not promote growth comparable with the best growth secured in the present study.

As beta lactose, milk sugar becomes a food, F. M. Greenleaf (*Food Indus., 5 (1933), No. 8, pp. 304–306, figs. 3*).—This is a popular account of the manufacture, properties, and possible food uses of beta lactose, which differs from ordinary lactose chiefly in its greater solubility and sweetness.

Home preparation of strawberry juice, G. A. Shuey (*Tennessee Sta. Circ. 48 (1934), pp. 2*).—Simple directions are given for the home preparation and bottling of strawberry juice for use as a beverage or in the preparation of a sirup for flavoring purposes.

How to make cranberry jelly, R. E. Cox (*Food Indus., 5 (1933), No. 9, pp. 348, 349, fig. 1*).—Difficulty in making a satisfactory jelly from cranberries is attributed to the too rapid action of the natural pectin in the cranberry. By destroying this pectin in cranberry pulp by the enzyme pectinase, available in commercial form under the name Pectinol, and then adding a slow setting pectin, a satisfactory jelly can be obtained. The process, which is to be patented, is said to be applicable to other fruits presenting similar difficulties.

Onion powder—a new use for cull onions, C. R. Fellers (*Food Indus., 5 (1933), No. 10, pp. 397, 404, figs. 3*).—This is a description of the process devised at the Massachusetts State College for the utilization of cull onions in a powder suitable for use in such food products as catsup and other similar condiments, baked beans, condensed and canned soups, and certain meat and fish products.

Egg drying has come back to America, A. K. Epstein (*Food Indus., 5 (1933), No. 8, pp. 308, 309, figs. 2*).—An account is given of the recent development of the dried egg industry in the United States, with brief descriptions of the methods used in drying whole eggs, egg yolk, and egg white, and a discussion of the problems involved in drying egg white in such a way that the product will have excellent foaming value. Thus far this has been accomplished by subjecting the egg white to a ripening or fermentation process before drying. A method is described for determining the foaming value of egg white.

Use and misuse of flavors, J. H. Montgomery (*Food Indus., 5 (1933), No. 10, pp. 400–402, fig. 1*).—This paper, presented at the 1933 convention of the National Confectioners' Association, is illustrated by a chart showing what flavors, both natural and synthetic, are suitable for use in various types of baked goods, confectionery, and miscellaneous foods and beverages.

Enzymes can cause off-flavors even when foods are frozen, H. C. Diehl, J. H. Dingle, and J. A. Berry (*Food Indus., 5 (1933), No. 8, pp. 300, 301, fig. 1*).—In this contribution from the Seattle laboratory of the U.S.D.A. Bureau of Plant Industry, the importance is emphasized of adequate scalding, followed by rapid cooling, of vegetables to be preserved by freezing. "The preliminary experiments indicate the persistence of enzymatic activity in unscalded frozen peas when these are thawed after storage for several months at 20° F. Experiments with other frozen vegetables packed without scalding and stored at

—5°, 15°, and 20° indicate that this is also true, in a greater or lesser degree, for asparagus, lima beans, corn, spinach, and beans."

Changes which may occur in frozen foods during cold storage, D. K. TRESSLER (*Food Indus., 5 (1933), No. 9, pp. 346, 347, fig. 1*).—The principal changes which may occur in frozen foods during cold storage are classified as *physical*, including desiccation of the product and growth in size of the ice crystals; enzymic, including oxidative and hydrolytic changes; and other chemical changes, such as coagulation of the protein and toughening of the fibrous materials in vegetables.

Preventing changes in stored frozen foods, D. K. TRESSLER (*Food Indus., 5 (1933), No. 10, pp. 410, 432, figs. 2*).—Methods are described for preventing some of the changes noted above.

Continuation and extension of work on vegetable proteins, L. B. MENDEL and H. B. VICKERY (*Carnegie Inst. Wash. Yearbook, 32 (1932–33), pp. 309–317*).—This progress report (E.S.R., 69, p. 144) includes summaries of a continuation of the investigation of the role of inorganic salts in the diet, a comparison by Block and Farquhar (E.S.R., 71, p. 139) of the antianemic and vitamin G potencies of various antianemic preparations, and a continuation of studies by A. H. Smith and W. E. Anderson on reproduction in the albino rat.

A study on the effect of fatty acids on nutrition.—II, Experiments with diets composed of rice, oil, and lipoid containing linoleic or linolenic acid, U. TANGE (*Bul. Agr. Chem. Soc. Japan, 9 (1933), No. 10–12, pp. 186–197, figs. 11; also in Inst. Phys. and Chem. Res. [Tokyo], Sci. Papers, 22 (1933), No. 450, pp. 1–14, figs. 11*).—In this continuation of the investigation noted previously (E.S.R., 69, p. 751), success is reported in the cure of the fat-free deficiency disease in young rats by lecithin, the neutral fat of soybean oil, and chrysalis oil, but not by rice bran oil.

***Studies on dietary requirements for lactation.*—I, Failure of lactation on an apparently complete synthetic diet,** W. NAKAHARA and F. INUKAI (*Inst. Phys. and Chem. Res. [Tokyo], Sci. Papers, 22 (1933), No. 469, pp. 301–307, figs. 2*).—A synthetic diet for rats is described which has been found to be adequate for good growth, excellent health, pregnancy, and parturition, but inadequate for lactation through lack of secretion of milk by the maternal rats. The diet consists of polished rice powder 75, fish protein 10, butter 10, and McCollum's salt mixture 5 percent, supplemented with brewer's yeast at the rate of 5 g per 100 g of the diet. It is prepared by adding water to the mixture and stirring the whole into a doughy consistency with moderate heating over the water bath.

No conclusions are drawn concerning the nature of the deficiency of the diet for lactation. It is suggested that the deficiency may be quantitative in regard to some constituent already present, or qualitative in that some indispensable constituent is entirely lacking, as suggested in recent work by Mapson (E.S.R., 68, p. 860).

The effect of the pasteurization of milk on the utilization of its calcium for growth in the rat, M. ELLIS and H. H. MITCHELL (*Amer. Jour. Physiol., 104 (1933), No. 1, pp. 1–9*).—The conflicting reports concerning the effect of pasteurization of milk on the utilization of calcium and phosphorus are reviewed briefly, and a further investigation of the problem as regards calcium is reported in paired feeding tests on rats. The basal diet was designed to be low in calcium but otherwise adequate for normal growth. The milk supplement of 1 rat in each of the 8 pairs consisted of raw milk and that of the other the same milk pasteurized in a glass container by raising the temperature to 142° F. in 20 min., holding it at this temperature for 30 min.,

and then diluting to the same volume. The experiment was continued for 30 days.

Small but statistically significant differences were noted in the growth, calcium content, and calcium retention in favor of the animals receiving the raw milk. Attention is called to the unusually high retention of calcium, the average percentages being 98 for the rats on the raw milk and 92 for those on the pasteurized milk. This is thought to indicate "not only that the processes of absorption are close to 100 percent efficient, and that the kidney withdraws only minimal amounts of calcium from the blood under these conditions, but it also must mean that in the growing rat, and possibly in all growing animals, there is no integral requirement of calcium for maintenance. In the adult the maintenance requirement for calcium may well represent merely a leakage of calcium ions through the kidney and the walls of the intestinal tract, due entirely to physicochemical processes. Calcium ions liberated in the course of catabolism from functional combinations in the tissues and body fluids are probably just as available for the reconstruction of such combinations as are calcium ions picked up from the intestinal tract. In the young growing animal these 'used' ions as well as the calcium ions coming directly from the alimentary tract may be absorbed and retained by the developing bones and the growing tissues at such a rapid rate that, at low levels of calcium feeding, the threshold of excretion by the kidneys and the intestines is never reached."

Bone development of infants and young children in Puerto Rico: Roentgenographic and clinical study, with special reference to rickets, osteoporosis, and transverse lines in radius and ulna, M. M. Eliot and E. B. Jackson (*Amer. Jour. Diseases Children, 46 (1933), No. 6, pp. 1237–1262, figs. 8*).—Physical and X-ray examinations were made of 584 Puerto Rican children from 1 to 34 mo. of age in order to compare the physical condition and roentgenographic appearance of the bones of infants living under the influence of tropical sunlight with similar observations previously made on infants living in a temperate climate (New Haven, Conn.). Determinations of the calcium and inorganic phosphorus content of the blood serum were made in 34 cases.

Height and weight values for the infants under 6 mo. of age paralleled closely those of white children in the United States, although at a slightly lower level. Beyond this age the differences were still greater, those of weight reaching a maximum of 14 percent. Infants under 7 mo., especially those who were breast fed, appeared to be the best nourished. Many of the older children showed distinct signs of malnutrition, with the majority classifying as of only fair or poor nutrition according to standards used in the United States. Motor development was slightly in advance of the children in the earlier New Haven study, and dentition occurred at an earlier age. From the roentgenographic examination only 5 cases of rickets were detected among the entire group. Of these 1 case was that of a 7-month-old infant who had never been out of an artificially lighted cellar, another a case of healed rickets which had occurred when the child had lived in New York City, and the other 3 very slight or slight rickets.

A definite clinical diagnosis of rickets was given to 50 children, a considerably higher percentage than was detected by X-ray examination. This discrepancy is discussed in considerable detail, with the conclusion that clinical diagnoses of mild rickets are unreliable.

Although very little evidence of rickets was shown in the roentgenograms, a condition of osteoporosis was revealed in 59 children, and of these 40 were of a rather severe type. The general physical condition of the children showing osteoporosis was poor, and it was concluded that the osteoporosis was associated with malnutrition and stunted growth. Attention is called in this connection

to the lack of calcium in the Puerto Rican diet. About one-third of the children showed transverse lines in the roentgenograms of the radius and ulna. These were among the poorly nourished children and indicated interruptions in growth.

The blood analyses included samples from 19 infants with normal roentgenograms, 9 doubtful, 5 showing osteoporosis, and 1 marked rickets. The average calcium content of 32 samples of blood was 10.6 mg per 100 cc of serum and the phosphorus content of 34 samples 5.2 mg. The product of Ca and P fell below 40 in only 3 cases, 1 from an infant with severe rickets and the other 2 severe osteoporosis.

The copper balance in the normal rat after ingesting various quantities of this metal [trans. title], R. GUILLEMET (*Compt. Rend. Soc. Biol. [Paris], 114 (1933), No. 36, pp. 1038–1040*).—Female rats on diets rich and poor in copper (1.8 and 0.8 mg daily) were shown to contain practically the same quantities of copper in the various organs, the excess copper ingested by one of the animals being eliminated almost entirely in the feces. It was shown that a very small amount of the copper is eliminated in the urine regardless of the amount ingested.

A study of the food habits and physical development of pre-school children over a two-year period, with special reference to seasonal variations in growth, H. MCKAY (*Ohio Sta. Bul. 532 (1934), pp. 77–79*).—This progress report (E.S.R., 69, p. 143) includes tabulated data and discussion on the average daily food intake of the children in calories, protein, calcium, phosphorus, and iron during each of four seasons of a 2-year period, and on the distribution of calories among the food groups as compared with suggested standards.

Iron in the diets of pre-school children, H. MCKAY (*Ohio Sta. Bimo. Bul. 167 (1934), pp. 73–77*).—This paper summarizes the results of computations of the iron content of the diets of 9 preschool children in the investigation referred to above. The youngest child was 16 and the oldest 40 mo. of age at the beginning of the experiment. The data are tabulated for the individual children by season for the 2 yr.

The minimum, maximum, and average values for the first year were 5.047, 8.435, and 7.003, and for the second year 7.342, 9.602, and 8.436 mg per day, respectively. Similar values per 100 calories were 0.470, 0.651, and 0.578 mg for the first year and 0.553, 0.723, and 0.648 mg for the second, respectively.

The iron intake of each child was higher in the second than in the first year of the experiment, but among individual children the intake did not increase consistently with age. On the basis of iron content per 100 calories, the youngest child exceeded the average of 4 of the older children and also the average of the entire group during the first year. The increased quantities of iron in the diet of the children as they grew older were due not only to increased caloric intake, but to a greater variety of food, particularly fruits and vegetables.

The minimum, maximum, and average percentages of iron derived from the various food groups during the first year were milk, 18, 36, and 23 percent; cereal grains, 11, 25, and 16 percent; fruits and vegetables, 31, 48, and 39 percent; and meat and eggs, 7, 30, and 21 percent. During the second year the corresponding values were milk, 15, 28, and 21; cereal grains, 7, 15, and 13; fruits and vegetables, 33, 48, and 43; and meat and eggs, 16, 38, and 21 percent, respectively. During both years the children using liberal quantities of eggs were among those showing the most liberal iron intake per 100 calories. Attention is also called to the relatively high proportion of iron furnished by milk, considered to be a poor source of iron.

Food habits of rural Rhode Island school children (*Rhode Island Sta. Rpt. [1933], pp. 73, 74*).—This progress report presents preliminary data on the average per capita milk consumption of the children.

Basal metabolism of women over thirty-five years of age, H. McKay (*Ohio Sta. Bul. 532 (1934), p. 79*).—In this progress report (E.S.R., 67, p. 87) data are given on the average basal metabolism in calories per square meter per hour of 12 women from 50 to 60 yr. of age, 5 from 60 to 70, and 1 over 70 yr. of age.

Modern views of vitamins and their functions, J. C. Drummond (*Jour. State Med., 42 (1934), No. 1, pp. 3–39*).—In the three Harben lectures for 1933, recent developments in knowledge of the vitamins are discussed under the following topics: Recent studies of the chemistry of the vitamins (pp. 3–19), the physiological function of the vitamins (pp. 20–30), and the vitamins in relation to practical problems of human nutrition (pp. 31–39).

Vitamins in muscat dates [trans. title], R. Lecoq (*Compt. Rend. Soc. Biol. [Paris], 112 (1933), No. 16, pp. 1661–1663*).—The presence of vitamins A, B, and C in muscat dates from south Algeria is demonstrated, but without sufficient data to establish quantitative values.

Vitamin deficiencies and the suprarenal glands, C. M. Blumenfeld (*Utah Acad. Sci. Proc., 10 (1933), pp. 79, 80*).—The general findings, without quantitative data, are summarized of a comparison of the weights of the adrenal glands of rats on complete diets and diets deficient in vitamins A, B, and E, respectively.

The A-deficiency tests included 10 control and 13 test animals, the latter consisting of 6 showing severe infection and 7 with only slight or no infection. The adrenals of the severely infected animals were hypertrophied and of the animals showing little or no infection atrophied, the changes from normal being confined chiefly to the cortex. In explanation of the difference, it is suggested that vitamin A deficiency alone may cause atrophy of the adrenals, but that when infection occurs the adrenals respond by hypertrophy, hiding the original atrophy.

In the vitamin B-deficiency experiments, 23 test and 8 control animals were used. The former showed consistent hypertrophy proportional to the degree of the deficiency. In most cases the cortex alone was involved, but in a few instances there was hypertrophy of the medulla as well.

The animals in the vitamin E-deficiency tests included as controls 22 virgin and 22 pregnant females and as test animals 23 E-deficient pregnant and 24 cured pregnant, the cured group consisting of rats carried through one pregnancy on an E-deficient diet, followed by another on a diet containing vitamin E. Pregnancy in itself appeared to have no effect on the adrenals. In the E-deficient pregnant rats the adrenals showed slight but not significant hypertrophy. The cortex in each case showed slight but insignificant hypertrophy and the medulla definite atrophy. In the adrenals of the cured rats, the medulla had returned to normal size and the cortex had definitely atrophied.

The influence of fertilizer treatment on the vitamin [A] content of spinach, M. Whittemore (*Rhode Island Sta. Rpt. [1933], pp. 94–97*).—In this final report of cooperative experiments carried on by three departments of the station and the department of biochemistry of Pennsylvania State College, the conclusion is drawn that the addition of nitrogen, potassium, phosphorus, and manganese in fertilizers "even to the extent of a serious reduction of the crop and of the production of chlorotic spinach does not appreciably affect the amount of vitamin A which it contains."

Liability of the "reducing factor" vitamin C?) in milk, S. K. Kon (*Nature [London], 132 (1933), No. 3323, p. 64*.)—The extreme lability of vita-

min C in milk is shown by titration values, as determined by the modification of the Tillmans test for ascorbic acid described by Birch, Harris, and Ray (E.S.R., 69, p. 169), of samples of herd milk and milk from individual cows at different periods after milking.

The findings were in agreement with those of Schlemmer at al. (E.S.R., 70, p. 136) as showing great irregularity and decreasing content with increasing interval after milking. "If—and the weight of evidence is at present in favor of such a view—this substance is identical with vitamin C, it would appear that, under existing conditions, the presence of vitamin C in reasonable amounts cannot be guaranteed even in very fresh milk samples of high quality produced under first-class conditions of feeding and management."

The evaluation of vitamin D preparations, III [trans. title], M. SCHIEBLICH (*Biochem. Ztschr., 265 (1933), No. 1–3, pp. 1–4*).—In this continuation of the papers noted previously (E.S.R., 65, p. 496), the substitution of buckwheat flour for wheat flour in the McCollum rickets-producing diet 3143 is suggested on account of its lower content of phosphorus. Data are presented on protective tests with the international standard vitamin D, using the original diet 3143 and the modified buckwheat diet. On the latter the minimum protective dose of the standard was almost double the dose when diet 3143 was used.

Diet and the teeth: An experimental study.—Part III, The effect of diet on dental structure and disease in man, M. MELLANBY (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 191 (1934), pp. 180, pls. 46, figs. 9; abs. in Brit. Med. Jour., No. 3814 (1934), p. 252; Lancet [London], 1934, I, No. 5, pp. 257, 258*).—This is the third and final report of the extensive investigation noted from part 1 (E.S.R., 63, p. 391) and other sources (E.S.R., 68, p. 869). The first three chapters deal with normal and abnormal development and structure of the teeth and the frequency and distribution of abnormalities. Dental caries is considered in the next few chapters dealing, respectively, with its prevalence, association between the structure of the teeth and dental caries, defensive reactions of the teeth, and diet and dental caries. Chapters on related problems with special reference to rickets, the racial distribution of caries as indicated by evidence produced in the various reports, and a general summary of the entire investigation, with the author's conclusions, complete the report. The importance of diet in the prevention of dental caries is indicated as follows:

"In order to reduce substantially the incidence of dental disease, especially in temperate zones, it is necessary to introduce large changes in the diet and habits of pregnant and lactating women, of infants, and of children during the whole period of dental development and, indeed, during the whole life. The consumption of milk, eggs, cheese, animal and fish fats, and vegetables must be greatly increased and the consumption of cereals correspondingly diminished, and, for the very young, abolished. Breast feeding must be general and prolonged even up to a year or more, provided a supplementary diet is given after about 6 mo., which should include some iron and vitamin C. Cod-liver oil or some other source of fat-soluble vitamins should be given to all infants and children.

"These then are the general principles of feeding which will certainly result in the formation of more perfect teeth and surrounding tissues, more regularly arranged in well-grown jaws. With better structure of dental tissues and increased resistance to bacterial invasion there is every reason to believe that both dental caries and pyorrhea will cease to be the scourge they are at the present time."

Diet and the teeth (*Brit. Med. Jour., No. 3814 (1934), p. 246*).—In this editorial comment on the report noted above, attention is called particularly to the marked change in attitude which has taken place in the last decade toward the cause of dental decay. It is noted that at the beginning of the investigation "caries was regarded as a simple problem of bacterial invasion which could be combated only by oral hygiene, while the tooth was assumed to play a passive part in the process. Mrs. Mellanby's work has provided the conception of teeth as living organs which can resist decay if their development and structure are normal."

The prevention of dental caries (*Lancet [London], 1934, I, No. 5, pp. 245, 246*).—In this editorial comment on the report noted above, the view is expressed that "while we acknowledge the value of this contribution to preventive medicine, we would deprecate any tendency to decry attempts to promote and maintain oral hygiene, at any rate until it is definitely proved that the dietetic environment is a negligible factor in dental caries."

The relationship of Lactobacillus acidophilus to dental caries in experimental animals and in human beings, M. M. JOHNSTON, M. J. KAAKE, and M. C. AGNEW (*Jour. Amer. Dental Assoc., 20 (1933), No. 10, pp. 1777–1784*).—The theory of Bunting and his associates (E.S.R., 70, p. 571) that *L. acidophilus* is the chief etiologic agency in dental caries was tested by determining the incidence of lactobacilli about the teeth of the rats used in the investigation by Agnew et al. noted previously (E.S.R., 70, p. 285) and correlating the bacteriological findings with the presence or absence of dental caries in these animals. A similar study was made of the incidence of corresponding organisms about the teeth of the children included in the above noted investigation.

A micro-organism similar to *L. acidophilus*, as isolated from the human mouth, was isolated from the mouths of the rats. The incidence of this organism was high in 27 out of 30 rats with carious teeth and in 109 out of 153 showing no sign of caries. Normal rats on a normal diet showed wide variations in the incidence of the organism, and the presence of a uniformly distributed high sugar content in the diet of rats free from caries did not increase the incidence. Wide differences in the incidence of *L. acidophilus* were also noted in the work with children. Children with caries showed a high or low incidence, and certain children who had no caries had a high incidence of the organism. In no case was *L. acidophilus* completly absent.

The authors conclude that *L. acidophilus* is a member of the normal flora of both the rat and human mouth, and that its possible etiologic significance in the production of dental caries is questionable on account of the high incidence of the organism in caries-free rats and human beings. "Adequate nutrition of the teeth appears to be fundamental in the promotion of their health. Nevertheless, lowered resistance of the teeth due to some disturbance in their nutrition provides suitable opportunity for the lactobacilli, as well as other bacteria present in the mouth, to attack the tooth structure, resulting in carious processes."

Diabetes in childhood and adolescence, P. WHITE (*Philadelphia: Lea & Febiger, 1932, pp. XIII+17–236, pl. 1, figs. 25*).—This monograph, which contains a foreword by E. P. Joslin, is based upon the history of about 1,000 diabetic children and adolescents treated in the Joslin clinic from 1898 to 1931. Of particular interest from the standpoint of nutrition are the chapters on physiology, which includes sections on carbohydrate metabolism, fat metabolism (by H. Hunt and the author), and basal metabolism; growth and development; treatment, including sections on the principles of the dietary treatment

of the diabetic child, hospital management, and aftercare; and pathology, which includes a discussion of abnormal carbohydrate and fat metabolism in diabetes. Of general interest are the chapters dealing with the history of 76 diabetic children, who, at the time of writing, had survived diabetes for 10 or more years, and with the subsequent careers of diabetic children. In the concluding section, the author states that "the care of the diabetic child resolves itself mainly into three factors: (1) The maintenance of the normal physiological processes of the growing and developing organism; (2) the prevention of the accidents of diabetes; (3) the eventual production of an individual who will be an economic and a social asset."

Studies on the nervous system in deficiency diseases.—II, Lesions produced in the dog by diets lacking the water-soluble, heat-stable vitamin B_2 (G). H. M. ZIMMERMAN and E. BURACK (*Jour. Expt. Med., 59 (1934), No. 1, pp. 21–34, pls. 3*).—In this continuation of the investigation noted previously (E.S.R., 69, p. 311), dogs on an artificial ration vigorously purified of vitamin B_2 did not develop blacktongue, but instead a slowly progressive disease characterized by loss of weight, persistent vomiting, diarrhea, and marked physical weakness ending fatally in from 200 to over 300 days. "The anatomic changes in this condition consist of marked demyelination of the peripheral nerves, including the vagus; degeneration of the medullary sheaths and replacement by gliosis of the posterior columns of the spinal cord, particularly the fasciculi graciles; degeneration of the medullary sheaths of the posterior and less often of the anterior nerve roots of the cord; occasionally slight degenerative changes in most of the other fiber tracts of the cord. Attention is called to the fact that degenerative lesions in the central nervous system similar or identical with these have frequently been described in pellagra in man." The report is illustrated with several microphotographs.

Results of mass treatment of late rickets and osteomalacia, D. C. WILSON (*Lancet [London], 1933, II, No. 17, pp. 919, 920*).—This summary of a continuation of the clinical investigations noted previously (E.S.R., 65, p. 398) consists chiefly of a comparison of the clinical value of cod-liver oil, Indian yeast sun-irradiated as described previously (E.S.R., 68, p. 133), and compound tablets of calciferol, calcium, and sodium phosphate in the treatment of late rickets and osteomalacia in India.

The greatest clinical improvement was obtained from cod-liver oil, but with the disadvantages of relatively high cost, digestive disturbances, and the unsuitability of fluid preparations for field work. These disadvantages did not hold for the tablets, but they proved less effective. Improvement on the sun-irradiated yeast was slow but definite. The cost was low, and digestive disturbances were trifling.

The preparation is described of two samples of sun-irradiated yeast. One was a yeast of definite high ergosterol content and the other the same type as used in the clinical studies. Each was exposed in thin layers in finely divided form to direct sunlight in October for 1 hr., the material being stirred after the first half hour.

The vitamin-D potency of sun-irradiated dried yeast, K. H. COWARD (*Lancet [London], 1933, II, No. 17, p. 920, figs. 16*).—The two samples of sun-irradiated yeast described above were tested for antirachitic potency in curative tests on young rats rendered rachitic on the Steenbock diet 2965. Comparisons of the two samples in doses of 0.5 percent with a dose of 0.25 international unit of vitamin D showed that the sun-irradiated yeast of high ergosterol content contained at least 20 international units of Vitamin D per gram, while the other contained less than 0.5 unit per gram. "It is, there-

fore, concluded that yeast may be activated antirachitically by exposure to strong sunlight, and that different samples of dried yeast may differ greatly in the extent to which they may be thus activated."

Clinical tests of the antirachitic activity of calciferol, J. C. SPENCE (*Lancet [London], 1933, II, No. 17, pp. 911–915, figs. 9*).—Clinical observations are reported on the treatment of 12 children suffering from active rickets with daily doses of crystalline calciferol for 11 weeks or more, 8 untreated children with severe rickets serving as controls. Exact comparison of the therapeutic value of calciferol with other vitamin D preparations was impossible, as daily doses of less than 1 cc of the calciferol solution (3,000 units) were not given. The results, however, showed that "calciferol had an active curative effect on the rickets, and that it produced healing at an optimal rate, acting as quickly and effectively as the usual therapeutic doses of cod-liver oil or irradiated ergosterol. The results of the antirachitic activity of calciferol were confirmed by observations on two pairs of twins, one member of each being kept as control, and also on a child with an exactly controlled diet."

The effect of antiscorbutic deficiency on the pregnant organism and dental tissues, C. D. M. DAY (*Jour. Amer. Dental Assoc., 20 (1933), No. 10, pp. 1745–1769, figs. 21*).—Histologic examination of the teeth of pregnant and nonpregnant guinea pigs on diets furnishing varying amounts of vitamin C showed that the teeth of the pregnant animals were affected to a greater degree by a slight deficiency in vitamin C than were the teeth of nonpregnant animals. Although the effect of the deficiency was generally not as marked in the teeth of the fetuses or young as in those of the mother, dentin formation was defective and other degenerative changes were apparent. Occasionally the teeth of the young were more seriously affected than those of the mother.

It is noted that although the teeth of guinea pigs are different from those of man in that they are of continuous growth, "the odontoblasts of the human tooth are still functional at least until posteruptive calcification has been completed. It is, therefore, reasonable to assume that the human tooth pulp may react similarly to that of the experimental animals under conditions of antiscorbutic deficiency, and that the calcification of the hard structures of the tooth may be similarly affected, at least during the formative period."

The heart valves in experimental scurvy and in scurvy with superimposed infection, J. F. RINEHART and S. R. METTIER (*Amer. Jour. Path., 9 (1933), No. 6, pp. 932, 933*).—This paper reports in abstract a series of experiments conducted on guinea pigs to determine the effect upon the heart valves and muscles of (1) uncomplicated scurvy, acute and chronic, (2) scurvy combined with infection, and (3) infection alone. The basal diet used was a slight modification of one described by Dalldorf (E.S.R., 66, p. 795). On the basal diet alone the condition developing was designated total scurvy; on the diet with inadequate amounts of orange juice a condition of subacute or chronic scurvy occurred, the latter term being used for the condition of the animals maintained on inadequate vitamin C for a long period. The infecting organism was a β-hemolytic streptococcus which was injected intracutaneously.

The control animals and those receiving an adequate diet with infection showed with one or two exceptions essentially normal heart valves. In acute or severe chronic scurvy, without infection, atrophic and degenerative changes were observed in the heart valves, while in scurvy with added infection lesions of a combined degenerative and proliferative character developed which showed striking similarity to those of acute rheumatic fever in man.

The heart valves and muscle in experimental scurvy with superimposed infection, with notes on the similarity of the lesions to those of rheumatic fever, J. F. RINEHART and S. R. METTIER (*Amer. Jour. Path., 10 (1934), No. 1, pp. 61–80, pls. 4*).—This is the detailed report, with microphotographs illustrating the lesions involved, of the investigation noted above from a preliminary report.

The joints in experimental scurvy and in scurvy with superimposed infection, with a consideration of the possible relation of scurvy to rheumatic fever, J. F. RINEHART and S. R. METTIER (*Amer. Jour. Path., 9 (1933), No. 6, pp. 952–955*).—This preliminary report includes a description of the histological examination of the joints of the various groups of guinea pigs in the investigation noted above and a discussion of the possible relation of scurvy to rheumatic fever, as determined by comparison of the social, age, and seasonal incidence of the two diseases, their geographical distribution, and symptoms. As was true of the heart valves, the condition of the joints in the animals subjected to both scurvy and infection resembled that of rheumatic fever.

Further observations on pathologic similarities between experimental scurvy, combined with infection, and rheumatic fever, J. F. RINEHART, C. L. CONNOR, and S. R. METTIER (*Jour. Expt. Med., 59 (1934), No. 1, pp. 97–114, pls. 4*).—This is the complete report of the investigation noted above, with microphotographs illustrating the joint lesions. From the standpoint of clinical and epidemiological evidence, "it is suggested that a subclinical degree of scurvy may constitute the rheumatic tendency in which the added factor of infection causes the development of rheumatic fever or possibly the closely allied condition of rheumatoid arthritis."

TEXTILES AND CLOTHING

A study of the raw cotton and the yarn and sheeting manufactured from three grades of American upland cotton (*U.S. Dept. Agr., Tech. Bul. 406 (1934), pp. 70, figs. 30*).—To compare some properties of cotton fibers, yarns, and fabrics, and to furnish a basis for studying the relation of the quality of raw cotton to the service, laundering, and ironing properties of fabrics manufactured from them, 3 bales of American upland cotton from the Texas area, crop 1928–29, selected to represent each Good Middling, Middling, and Strict Good Ordinary grades, approximately 1 in. in staple length and similar in character, were manufactured in cooperation with Clemson Agricultural College into sheeting of a definite construction and subjected to service and ironing tests. The described conditions and procedures employed were controlled and were comparable insofar as possible. The studies are reported in 4 parts.

Setting of the problem, R. W. Webb (pp. 1, 2).—The scope of the study is indicated.

The manufacturing procedure and some properties of the raw cotton, intermediate products, yarns, and fabrics, H. H. Willis and R. W. Webb (pp. 2–24). —The Good Middling and Strict Good Ordinary cottons furnished waste in quantity considered average for their respective grades, and the Middling cotton gave somewhat less than the average of this grade. During manufacture the length of fibers from the 3 cottons did not change appreciably. The number of ends broken per 100 spindles per hour increased with decreasing grade. As a result of finishing, a reduction of about 14 percent in the width and about a 3 percent increase in length of the sheeting occurred. The brilliance of the raw cottons decreased as the grade became lower, and this relation was evident in measure throughout manufacture. In general, spectrophotometric measure-

ments made on the fabrics established a similar relation, but some differences in reflection were observed between gray and bleached fabrics. Although gray fabrics manufactured from the lower grades averaged more fine particles of foreign matter, the finished fabrics were practically free of them. Yarns made from Good Middling and Middling cottons were about equal in strength, while those from the Strict Good Ordinary were from 10 to 18 percent weaker. The corrected tensile strengths of the gray and of the bleached fabrics decreased as the grade became lower, but the relative strength of the fabric from Middling cotton was much nearer to that for Good Middling than to that for Strict Good Ordinary. Bursting strengths of the gray and of the bleached fabrics from Good Middling and Middling cottons were about equal and much higher than that of corresponding fabrics made from Strict Good Ordinary. Bleaching resulted in a reduction of about 33 percent in bursting strength for the fabrics.

Serviceability of the fabrics, M. B. Hays and R. E. Elmquist (pp. 24–48).—Changes in the physical and chemical characteristics of the sheetings made from these 3 cottons and subjected to controlled service and laundering were determined at intervals during their wear life. As measured by physical tests, the sheets from Strict Good Ordinary cotton were weaker initially and throughout their period of wear than those made of Middling and Good Middling cotton, which were of the same order. Sheets woven from Strict Good Ordinary were slightly more deteriorated at the end of 200 washings than were the others at the end of 225 washings. Copper number and methylene blue absorption tests showed that the cellulose of the Strict Good Ordinary cotton was degraded less during the major part of its wear life than was that of the other 2 cottons, although in the last stages of wear it was deteriorated slightly more. The oxidation product formed was characterized by greatly increased affinity for methylene blue. The maximum wear occurred on all of the sheets at the section usually occupied by the shoulders, but there was no increased wear on the middle fold and no change in unused sheets after storage for 3.5 yr.

Effects of ironing temperatures upon the fabrics, K. M. Downey and R. E. Elmquist (pp. 48–64).—New sheetings made from the 3 cottons were desized and ironed under controlled temperature, time, pressure, and moisture conditions. The ironing procedure was developed with a roll-type household ironer in which the pressure maintained between the roll and the heated shoe was 1.25 to 1.5 lb. per square inch, and the time of sliding contact of the sample with the shoe was about 2.5 sec. When the initial surface temperature of the padded roll was 38° to 40° C., no changes were produced in the cottons at ironing temperatures below 245°. At the highest ironing temperatures used all desized sheetings showed a lower breaking strength, a decreased surface reflectance in the violet part of the spectrum, increased fluidity in cuprammonium solution, higher copper numbers, and a comparatively low methylene blue absorption. A slightly greater heat resistance was evident for the desized sheeting made from Strict Good Ordinary cotton than for the other 2 sheetings. Before being damaged by ironing this desized material made from Strict Good Ordinary cotton had lower values for breaking strength and surface reflectance as well as higher values for copper number and fluidity than sheetings from Middling and Good Middling cotton. When worn sheetings made of the cottons were subjected to the same ironing conditions after different periods of service, during the first third of their useful life, they all showed physical and chemical changes similar to those obtained with the new desized materials, but in the last third of their wear life the worn materials showed a greater decrease in surface reflectance and a higher methylene blue absorption.

Flax fibre structure and quality, I–III, S. A. G. CALDWELL (*Textile Manfr., 58 (1933), Nos. 702, pp. 217, 218, figs. 4; 703, pp. 263, 264, fig. 1; 704, pp. 303, 304, figs. 3*).—Cultural, processing, and structural factors which affect the quality of flax fiber are described and appraised.

The influence of position isomerism (structural differences) in azo dyes upon their fastness to light and washing, M. GRIFFITH (*Ohio Sta. Bul. 532 (1934), pp. 79, 80*).—This progress report (E.S.R., 67, p. 93) lists the dyes which have thus far been made, with the results of analyses of the dyes for purity.

HOME MANAGEMENT AND EQUIPMENT

The rural Rhode Island homemaker who contributes to the family cash income (*Rhode Island Sta. Rpt. [1933], pp. 71–73*).—This progress report (E.S.R., 69, p. 317) includes tabulated data on the labor-saving equipment and services used by homemakers who were gainfully employed and a general summary.

Present guides for household buying, R. O'BRIEN and M. M. WARD (*U.S. Dept. Agr., Misc. Pub. 193 (1934), pp. 32*).—This publication discusses, with 119 citations, the existing types of consumer guides and quality grades now in use for food products, food containers, clothing and textiles, household equipment and furnishings, service industries, and a number of miscellaneous products including cement, coal, drugs, leather, lumber, etc.

Choosing and operating electric stoves, A. E. BARAGAR and E. B. SNYDER (*Nebraska Sta. Circ. 47 (1934), pp. 22, figs. 22*).—This circular, based on Research Bulletin 68 (E.S.R., 70, p. 730), discusses electric stoves and presents information to aid in choosing and operating such equipment.

MISCELLANEOUS

Report on the agricultural experiment stations, 1933, J. T. JARDINE, W. H. BEAL, ET AL. (*U.S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1933, p 78*).—This report is discussed editorially on page 289.

Fifty-second Annual Report of [Ohio Station], 1933, C. G. WILLIAMS ET AL. (*Ohio Sta. Bul. 532 (1934), pp. 112, figs. 17*).—The experimental work reported not previously referred to is for the most part noted elsewhere in this issue.

Report of the Puerto Rico Agricultural Experiment Station, 1933, T. B. MCCLELLAND (*Puerto Rico Sta. Rpt. 1933, pp. [2]+24, figs. 14*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-sixth Annual Report [of Rhode Island Station, 1933], B. E. GILBERT ET AL. (*Rhode Island Sta. Rpt. [1933], pp. 53–100*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Data on turkey production costs, by R. B. Corbett and J. L. Tennant (pp. 76-78), are also included.

New Jersey Agriculture [March–April 1934] (*N.J. Agr., 16 (1934), No. 2, pp. 8*).—In addition to data abstracted elsewhere in this issue, this number contains Farm Leaders Attend Economic Institute, by E. I. Cronk (pp. 1, 2), and Rye Prices and Production Costs, by J. W. Carncross (pp. 4, 5).

NOTES

Arizona University.—The honorary degree of doctor of science was conferred at the recent commencement on Hon. Henry A. Wallace, Secretary of Agriculture, "in recognition of his scientific contribution and fearless leadership in the cause of agriculture."

Arkansas University and Station.—Dan T. Gray, dean of the College of Agriculture and director of the station, has been given leave of absence for a year, and beginning July 15 will serve as regional director of the land policy section of the U.S.D.A. Agricultural Adjustment Administration. In this capacity he will have charge of the Federal land utilization program in Mississippi, Arkansas, Louisiana, Texas, and Oklahoma. Dr. C. O. Brannen, assistant director of research, has been designated acting director of the station.

Idaho University and Station.—Dr. John Merton Aldrich, professor of zoology and general biology in the University from 1893 to 1913, and entomologist in the station from 1893 to 1905, therefore one of the pioneer station entomologists in this country, died in Washington, D.C., on May 27 at the age of 68 years. Dr. Aldrich was a native of Minnesota, graduated from the South Dakota College in 1888, and subsequently received the M.S. degree from that institution and the University of Kansas and the Ph.D. degree from Stanford University. In 1913 he became connected with the U.S.D.A. Bureau of Entomology, making extensive studies of flies at La Fayette, Ind., and since 1919 had been associate curator of the Division of Insects of the U.S. National Museum. He became an outstanding authority on the Diptera, compiling in 1905 a Catalog of North American Diptera, and his most recent research was an extensive study of the Tachinidae.

Louisiana University and Station.—Dr. Harry Morris, professor of animal pathology and associate animal pathologist, died May 4 at the age of 53 yr. He was a native of Ohio, received the D.V.M. degree from Ohio State University in 1910, and had been connected with the work in Louisiana thereafter. Dr. William Thomas Oglesby of the Michigan College has been appointed assistant professor of animal pathology in his stead.

Massachusetts College.—Dr. Walter S. Ritchie, assistant professor of agricultural chemistry in the University of Missouri and assistant agricultural chemist in the station, has been appointed professor and head of the department of chemistry.

Michigan Station.—Dr. R. H. Pettit, connected with the station for 37 yr. and head of the department since 1906, has been made consulting entomologist, effective September 1. Ray Hutson, research associate entomologist, has been appointed entomologist.

Nevada Station.—A project to test the practicability of the rotation grazing of sheep under actual ranch conditions was begun May 4 under a cooperative agreement between the station and a land and livestock company at Elko. This trial is to be an extension of the experiments with pasture grasses and methods of use which have been carried on for several years on the station farm, and will be started on a rather limited scale. Because of the present water deficiency, actual seeding will be delayed until the spring of 1935. Irrigated and semiarid grasses will be tried out on selected plats in an attempt to get more intensified production on small areas. Fences will be constructed

by the station, but of a portable nature subject to removal or sale at the conclusion of the test. The ranch will provide the land, livestock, machinery and equipment, board and lodging, stock sheds, and all costs incidental to handling and feeding the livestock.

Another new project has been initiated by the department of irrigation and agronomy which has for its object an inventory of the land and water resources of the Truckee River Valley.

The same department also completed a short report on the drought conditions in Nevada in 1934 for use in emergency relief work of the Federal Emergency Relief Authority. This report dealt especially with the drought conditions on the Nevada ranges and the means by which the extreme shortage of forage could be alleviated. The study developed the fact that the present drought is the most severe which this State has experienced in its history, forage production on the irrigated lands averaging only about 20 percent of normal and with similar conditions prevailing on the range lands.

Rutgers University and New Jersey Stations.—At the recent commencement the honorary D.Sc. degree was conferred on Dr. C. B. Lipman, professor of plant physiology in the University of California.

Dean and Director J. G. Lipman has been granted leave of absence to June 30, 1935, during which period Dr. William H. Martin will serve as acting director of the stations. Dr. V. A. Tiedjens has returned after 2 yr. of commercial work and will carry on research in vegetable gardening.

Cornell University and Station.—Dr. M. F. Barrus, extension professor of plant pathology, has been given 2 yr. leave of absence to take charge of agricultural extension work in the Puerto Rico Insular Station at Rio Piedras. Dr. P. P. Pirone, formerly in charge of Dutch elm disease eradication in Nassau County, Long Island, has been appointed acting extension professor of plant pathology during his absence. Research on the Dutch elm disease is to be continued under a special appropriation by the State legislature with the work in plant pathology under the direction of Dr. D. S. Welch, assistant professor of plant pathology, and in entomology by Dr. P. A. Readio of the University of Kansas, who has been recently appointed assistant professor of entomology.

Dr. Frederick B. Hutt, professor of poultry husbandry and associate poultry husbandman in the Minnesota University and Station, has been appointed head of the poultry department, effective July 1.

Pennsylvania College and Station.—President R. D. Hetzel was the recipient of the LL.D. degree from the University of Pennsylvania at its recent commencement.

The Pennsylvania Research Corporation has been formed to reserve patent rights on inventions and discoveries made by the college and station in order to insure their perpetuation in the public interest.

The Mushroom Growers Cooperative Association of Pennsylvania has contributed funds for the erection of an experimental mushroom house at State College.

J. L. E. McCord, professor of agricultural economics and agricultural economist, has been granted leave of absence to June 1, 1935, for the purpose of organizing research in agricultural economics in the Puerto Rico Insular Station at Rio Piedras.

Puerto Rico Federal Station.—At the recent commencement of the University of Missouri, the degree of doctor of laws was conferred upon D. W. May, director of the station from 1904 to 1930 (E.S.R., 62, p. 601).

EXPERIMENT STATION RECORD

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EDITORIAL

THE TWELFTH INTERNATIONAL VETERINARY CONGRESS

International congresses on veterinary science have been assembling at intervals of from 2 to 16 yr. since 1863, but the Twelfth Congress held in New York City from August 13 to 18, 1934, was the first outside of Europe. Organized in Hamburg over 70 yr. ago, these congresses have subsequently met in Wien (Vienna) in 1865, in Zürich in 1867, in Bruxelles (Brussels) in 1883, in Paris in 1889, in Bern in 1895, in Baden in 1899, in Budapest in 1905, in 's Gravenhage (The Hague) in 1909, and in London in 1914 and 1930. For most members of the veterinary profession in the Western Hemisphere, therefore, the New York Congress was their first opportunity for direct contacts with their coworkers abroad, as well as a substantial if possibly somewhat belated recognition of American contributions and accomplishments in this important field of scientific activity.

Interest in the Congress was literally world-wide. Representatives of nearly 40 foreign countries were in attendance, drawn from most of those in Europe, Canada, and regions as far away as Argentina, the Union of South Africa, Japan, Australia, and New Zealand. The total of those for all countries approximated 1,850, the enrollment from the United States including, among others, representatives of the Department of Agriculture, the agricultural colleges and experiment stations, other veterinary colleges and research institutions, health departments, and a large number of veterinarians in private practice.

The importance of the Congress from an official viewpoint was reflected in its organization with President Franklin D. Roosevelt as patron and Secretary of Agriculture Henry A. Wallace as vice patron, and (in their absence) in the formal opening of the Congress by M. L. Wilson, Assistant Secretary of Agriculture. The proceedings also, as previously mentioned in these columns, are to be printed at the expense of the Federal Government.

Arrangements for the Congress were in the hands of a committee headed by Dr. A. Eichhorn. Its organization was completed at the

opening session by the election as president of Dr. John R. Mohler, Chief of the U.S.D.A. Bureau of Animal Industry, with Dr. C. P. Fitch and Dr. Eichhorn as vice presidents and Dr. H. Preston Hoskins as general secretary.

The program included three general sessions and numerous meetings of the seven sections, as well as social gatherings, a surgical clinic for small animals at Columbia University, and an excursion to the Rockefeller Institute for Medical Research at Princeton and the Walker-Gordon farm at Plainsboro, N.J. The seventy-first annual convention of the American Veterinary Medical Association was also held during the week, and at the close of the Congress opportunities were afforded for tours including governmental laboratories and experimental farms, a number of veterinary schools, and other points of interest in this country and Canada.

The presidential address of Dr. Mohler dealt with the relationship of veterinary science to animal breeding and public health and the legal protection of the practice of veterinary science. Dr. Mohler drew attention to some of the important interests shared in common by veterinary science and medical science, as in the studies of tick fever, which developed the fact that insects may carry diseases and were "the basis for controlling malaria, yellow fever, typhus, bubonic plague, and many other human diseases carried by insects," and the discovery that the causal agent of infectious abortion of cattle is intimately related to the organism causing undulant fever in man. Meat and milk inspection have become, in his opinion, effective barriers to the spread of livestock infections to man, and veterinary supervision of animals at the time of slaughter is "the basis for an extensive pharmaceutical industry which utilizes glands and other parts of animals for human ailments." Similarly manufacturers of antitoxins, serums, bacterins, and other biological products make use of many methods which originated in veterinary science.

The public health element in veterinary science, he pointed out, is responsible in part for many of the regulatory services which in the United States are assigned to the Bureau of Animal Industry for administration. These include international and interstate inspections, including quarantines and supervision of transport of animals and animal products; meat and dairy inspections; hog cholera immunization at public markets; control and eradication of animal diseases; and cooperation with practitioners and in local efforts in disease control.

Because of its services to mankind, veterinary science has obtained legal protection "comparable in every respect to that enjoyed by other professions in the United States." This has contributed "directly and forcefully to the extension of scientific usefulness in the community, State, and Nation." Such protection Dr. Mohler deemed

"a recognized public necessity, in both a national and international sense, for the reason that the proper distribution and application of veterinary knowledge are world needs."

The total number of papers presented at the Congress was about 80. This was not a large output for congresses of this type, but it constituted a skillful selection which afforded representation from 26 of the various countries participating and a wide range of subject matter.

In addition to the presidential address, the general sessions included papers on New Plans for the Combating of Enzootic Diseases Under a State Veterinary Service, contributed in absentia by Dr. E. Leclainche of France; Veterinary Control of the Marketing of Milk, by Dr. R. von Ostertag of Germany; New Researches on Filtrable Viruses, by Drs. R. Manninger of Hungary and F. Gerlach of Austria; and New Researches on Contagious Abortion, by Prof. O. Bang of Denmark, Dr. W. E. Cotton of the U.S.D.A. Bureau of Animal Industry, and Prof. G. Finzi of Italy. In section 1, pathology, bacteriology, and contagious diseases, the topics taken up were new methods of protective inoculation of anthrax; lymphadenitis of sheep; mosquitoes as vectors of the virus of equine encephalomyelitis; tuberculosis (eradication, immunity, and protective inoculation); active immunization for hog cholera and tetanus; specific preventive measures for foot-and-mouth disease; classification of the paratyphoid diseases; etiology, classification, and prophylaxis of gas edema diseases; and infectious anemia of horses.

Section 2, medicine, surgery, and obstetrics, discussed infectious mastitis, diseases of young animals, parturient paralysis, sterility, and recent progress in veterinary surgery. In section 3, veterinary parasitology and parasitic diseases, coccidiosis, therapeutics of worm disease, and immunity against parasites were considered. Section 4, fowl diseases, dealt with fowl pox, coryza, psittacosis, pullorum disease, fowl plague, leukemia, and neurolymphomatosis gallinarum. At the single session of section 5, tropical diseases, the classification of piroplasmoses, spirochetosis, African horse sickness, and anaplasmosis received attention. Section 6, hygiene of meat and milk, dealt with the pasteurization of milk and the unification of the methods of meat inspection, and section 7, animal breeding and dietetics, with genetics, the blood-group question, deficiency diseases, and the scientific principles of feeding.

While many of the original papers were presented in foreign tongues, printed abstracts were available in English and French and usually in German and Spanish translations. Oral summaries of the discussions were also common. In these ways linguistic difficulties were reduced to a minimum. Radio broadcasts over a network of

some 60 stations in the United States, with a pickup by three short-wave stations that gave a wide international distribution, were a supplementary feature of the Congress which enhanced its direct popular appeal.

Toward the close of the Congress the Budapest Medal, awarded every 4 yr. to the author of an outstanding contribution to veterinary science during the preceding decade, was bestowed upon Sir Arnold Theiler, actively associated with the development and direction of veterinary education and research in South Africa from 1891 to 1927 and the author of many publications on diseases of domestic stock. A number of resolutions were adopted before adjournment, among them one urging greater attention by veterinary schools and associations to the study of genetics and another favoring the appointment of a committee to study from an international point of view the control of parasites and parasitic diseases. Increased attention to work with tuberculosis, lymphadenitis of sheep, diseases of young animals, and poultry diseases, as well as veterinary supervision of milk supplies and improved organization and facilities for the international exchange of veterinary information, was also advocated. The decision was reached to hold the Thirteenth Congress in Switzerland in August 1938.

From many standpoints the Congress was an interesting and important occasion. Within recent years there has been a noteworthy increase in both the quantity and the quality of the veterinary research carried on by the Federal Department of Agriculture and the State experiment stations, looking toward the control or eradication of animal diseases and pests which increase so largely the hazards and costs in animal production and impair the quality of the product. As a recent report of this Office puts it, "the progress in this direction has been one of the outstanding achievements of research by these agencies." The benefits, both tangible and intangible, accruing from the contacts established at the Congress with so many of the world's eminent leaders in this field should be a further stimulation and encouragement in this direction. The Congress may, therefore, well be a milestone in veterinary progress, both in this country and abroad.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Chemical investigations of the Iowa Station**] (*Iowa Sta. Rpt. 1933, pp. 43, 60*).—Data are briefly reported on the fermentation products of xylan, and a study of the adaptation and development of the method of partition between solvents for the determination of fermentation products, both by C. H. Werkman; and on the identification of the water-soluble and the acid hydrolyzable carbohydrate constituents (hemicelluloses) of the cornstalk, by W. G. Gaessler and R. M. Hixon.

The nature of the alleged molecular sieve membranes, R. Beutner, M. Caplan, and W. M. Loehr (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 391–400*).—A collodion film was found not to be a chemically inert substance but to enter into chemical surface reactions with simple salt solutions in contact with it. Hydrochloric acid was thus formed, in the case of sodium chloride solutions, while sodium was taken up by the collodion. These findings are considered contradictory to the theory that collodion is inert and that potential differences following the variation of concentration are produced by differential ionic mobility in the pores, the pores acting as ionic sieves. Such chemical reactions at the phase boundary are believed to be the cause of the observed electromotive forces at collodion film interfaces, as well as that of the variation of these potential differences with the salt concentration.

The reduction potentials of cysteine, glutathione, and glycylcysteine, D. E. Green (*Biochem. Jour., 27 (1933), No. 3, pp. 678–689, figs. 6*).—Studying the reversibility of the cysteine-cystine system prepared by electrolytic reduction, the author found that the mercury electrode employed for the electrolytic reduction undergoes some alteration; that with renewal of the mercury electrode, the potentials do not conform with the equation for the reversible state; and that after passage of current through a mercury electrode in contact with a solution of cysteine, the equilibrium potentials of the mercury electrode are shifted to more negative values. The colorimetric and potentiometric values for the cysteine potential were found not to agree, the potentiometric values being more negative by approximately 90 mv or 3 r_H units. The increase in the reducing power of cysteine with increase in the molar concentration paralleled the electrode phenomena closely, however.

Potential measurements on both glutathione and glycylcysteine are recorded. These two sulfhydryl compounds were shown to exert negative potentials which depend only upon the concentration of reduced component. The E_0 of glutathione was determined as +0.062, that of glycylcysteine as +0.025. The colorimetric and potentiometric values for the glutathione potential were not in agreement, the potentiometric values being more negative by approximatively 60 mv or 2 r_H units. Qualitatively, however, the colorimetric and potentiometric data were comparable.

"The various theories proposed to explain the anomalies of sulfhydryl potentials have been reviewed. A suggestion has been made as to the lines of approach which a complete analysis must follow."

The anaerobic decomposition of l-cystine by washed cells of Proteus vulgaris, H. L. A. Tarr (*Biochem. Jour., 27 (1933), No. 3, pp. 759–763, fig. 1*).—It was shown that *l*-cystine undergoes anaerobic decomposition in the presence of washed cells of *P. vulgaris* with the formation of 2 molecules each of hydrogen sulfide, ammonia, and acetic and formic acids.

A pure culture of *P. vulgaris* was grown in an M/40 sterilized phosphate buffer solution of pH 7.8 in the presence of dry sterilized cystine under a (current) atmosphere of purified hydrogen. Hydrogen sulfide was collected in 2 percent zinc acetate solution, carbon dioxide in approximately 0.1 N barium hydroxide. The ammonia was distilled from 50 cc out of a total of 500 cc of the culture solution without the removal of the bacterial suspension. The greater part of the bacterial growth was then removed from the remaining 450 cc of the culture solution, and acetic and formic acids were determined in aliquots of this solution.

The preparation and properties of thyroglobulin, M. Heidelberger and W. W. Palmer (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 433–439*).—Aqueous extracts of hog thyroid glands were found to contain a fraction precipitable in the cold at pH 4.8 to 5.0. This fraction has the properties of a nucleoprotein and was detected as a contaminant of thyroglobulin isolated by the usual methods. "Its partial denaturation by half saturated [ammonium or sodium] sulfate would tend to eliminate a portion of it in repeated sulfate precipitations of thyroglobulin, but the rapid alteration undergone by thyroglobulin in the presence of acetic acid tends to make mixtures of thyroglobulin and the contaminant inseparable. If entirely undenatured thyroglobulin is desired, exposure to acetic acid at a pH below 4.8, even in the cold, should be avoided."

The ionization of dl-alanine from twenty to forty-five degrees, L. F. Nims and P. K. Smith (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 401–412, figs. 2*).—The experiments recorded showed that the method of determining the ionization constants of weak acids by means of cells without liquid junction is applicable to the representative amino acid *dl*-alanine. The values of pK_{a_1} and of pK_{a_2} for *dl*-alanine were determined from 20° to 45° C. with an accuracy greater than heretofore possible. The heats of ionization of *dl*-alanine were calculated from the variation of the pK_a values with the temperature.

Phenyl isocyanate protein compounds and their immunological properties, S. J. Hopkins and A. Wormall (*Biochem. Jour., 27 (1933), No. 3, pp. 740–753*).—Phenylureido and *p*-bromophenylureido compounds of caseinogen, gelatin, and horse serum-globulin were prepared by the action of ether solutions of phenyl isocyanate and of *p*-bromophenyl isocyanate on solutions of these proteins kept at pH 7 to 8. The properties of these compounds are described. Evidence suggesting that phenyl isocyanate and *p*-bromophenyl isocyanate react only with the free amino groups of the lysine molecules of the protein is presented. For example, the precipitin reaction between phenylureido proteins and the antisera to these compounds was specifically inhibited by phenylureido-amino acid compounds (glycine, alanine, and lysine); but inhibition was complete only in the case of the lysine compound. This observation "supports the view that the characteristic grouping in the new phenylureido proteins is phenylureido lysine."

The phenylureido derivatives of horse serum-globulin, when injected into rabbits, were found to produce antibodies giving precipitin reactions with the phenylureido and *p*-bromophenylureido compounds of horse serum, chicken serum, or even rabbit serum proteins, and with similar compounds of caseinogen and gelatin. Antibodies capable of reacting with any phenylureido protein

appeared, therefore, to have been produced. "The antisera to phenylureido horse serum-globulin do not react very strongly with the unchanged globulin; indeed, with one immune serum of this type, no precipitate at all was given with horse serum-globulin. Thus there appears to be a considerable loss, when the serum-proteins are converted into the corresponding phenylureido compounds, of the original species specificity or characteristics, although antisera to native horse serum-globulin give very marked precipitates with phenylureido horse serum-globulin." The significance of these findings is discussed.

The chemical separation of some cellular constituents of the Brucella group of micro-organisms, R. C. Huston, I. F. Huddleson, and A. D. Hershey (*Michigan Sta. Tech. Bul. 137 (1934), pp. 25*).—The authors record in working detail their methods for the preparation of material, the preparation of extracts, and the separation and examination of fractions, including the nucleoproteins, the water-soluble albumin, the albuminoid, the "S" substance, the "C" polysaccharides, and the lipids.

"The *Brucella* were found to be characterized as a group by the absence of free simple sugars, by the occurrence of nonprecipitating polysaccharides only, by a large proportion of water extractable proteins, and by cell lipids analogous to the conventional types found in higher organisms.

"The species of the genus *Brucella* could be differentiated one from another by the relative proportions, rather than kind, of two biologically inactive polysaccharide, and two lipid, constituents. *B. melitensis* was distinigushed further from the other two species [*B. abortus* and *B. suis*] by the occurrence of a nonprotein, nonpolysaccharide, precipitating antigen of a type hitherto undescribed."

The effect of hypertonic sugar solutions on the thermal resistance of bacteria, A. C. Fay (*Jour. Agr. Res. [U.S.], 48 (1934), No. 5, pp. 453–468, fig. 1*).—The results of a study at the Kansas Experiment Station are reported, dealing with the influence of heating suspensions of *Escherichia coli* at 54° C. for 9 min. in solutions containing sucrose, dextrose, lactose, and maltose on the ability of the organisms to survive.

The results showed that the protective action of the sugars increased with the increased osmotic pressure, but equimolal solutions of different sugars did not show the same protective action. It was also found that the use of carbohydrate agar enabled certain protection in recovery. It is suggested that the protective influence of the sugars may play a part in the heating of ice cream mix, preservation of condensed milk, canned fruits, honey, molasses, etc. It was possible by washing and centrifuging the bacteria to remove the protective action which the sugar solutions afforded. Hypertonic sugar solutions were found to delay or even prevent the coagulation of egg albumin and retard the inactivation of rennin by heat in other tests.

The pigments of the mandarin [trans. title], L. Zechmeister and P. Tuzson (*Hoppe-Seyler's Ztschr. Physiol. Chem., 221 (1933), No. 5–6, pp. 278–280*).—From the flesh of the ripe mandarin or tangerine (*Citrus madurensis*) the authors obtained 8.2 mg of carotene and 5 mg of xanthophyll per kilogram. The peel yielded 31.7 mg of carotene and 57.6 mg of xanthophyll per kilogram. The carotene was identified as consisting chiefly of β-carotene.

The dialysis of milk; The distribution of phosphorus, L. H. Lampitt and J. H. Bushill (*Biochem. Jour., 27 (1933), No. 3, pp. 711–722, figs. 5*).—The author describes a continuous dialysis apparatus using collodion thimbles by means of which dialysis may be carried out at a low temperature (0° to 5° C.), the dialyzate can be concentrated to a convenient volume, and the volume of distilled water used may be brought to a minimum. By applying a slightly reduced pressure to the outside of the dialyzing sac, ultrafiltration is combined

with dialysis. Dialysis of milk by this means was compared with that produced by a "static" (minimum dilution) dialysis method and with an ultrafiltration method. In all cases collodion thimbles were used. The comparisons between the determined amounts of total and of inorganic phosphorus in the dialysis fractions and in the ultrafiltrates were made. It was shown that the serum obtained by "static" dialysis of a solution of spray-dried separated milk powder has approximately the same total and inorganic phosphorus content as has that of an ultrafiltrate from the same solution.

"Continuous dialysis compared in a similar manner with static dialysis, using fresh separated milk, shows that the former method causes much more phosphorus to be dialyzable, and that this increase is confined entirely to the inorganic posphorus, the dialyzable organic phosphorus being the same in both cases. The results recorded show a certain constancy in the phosphorus distribution of the particular brand of spray-dried separated milk used. These results when compared with similar ones using bulked liquid separated milk support the contention of other workers that heat treatment reduces the inorganic phosphorus of the serum obtained by dialysis or by ultrafiltration." The experiments give some indication that either the heating or the desiccation involved in the spray-drying process causes a slight alteration in the relative proportion of dialyzable phosphorus.

The component fatty acids and glycerides of the milk-fats of Indian goats and sheep, D. R. Dhingra (*Biochem. Jour., 27 (1933), No. 3, pp. 851–859*).—The component fatty acids of Indian goat and sheep milk fats and of their fully saturated glycerides were determined in detail, and the general structure of the glycerides deduced. The results are compared with those previously obtained by other workers for cow butters and animal body fats.

"The content of the fully saturated glycerides in the two fats seems to be a function of the mean unsaturation, as in cow milk fats. The component fatty acids of the fully saturated glycerides are not so closely alike as in those of cow butterfats, and also differ from the latter. In the mixed saturated-unsaturated glycerides, however, the molar contents of myristic, palmitic, and stearic acids are very similar to those of the corresponding portions of cow butterfats, and the only difference is that in the goat and sheep milk fats there is about 10 percent (mols) less of C_{18} unsaturated acids and 10 percent (mols) more of the butyric-lauric acid group (the increase being mainly in capric and caprylic acids). The excess of capric and caprylic acids, as compared with cow butterfats, therefore, appears to be almost wholly at the expense of oleic acid."

The distribution of sulphur in goat hair, D. Jordan-Lloyd and R. H. Marriott (*Biochem. Jour., 27 (1933), No. 3, pp. 911–914*).—The authors find the cortex of goat hair to be separable from the medulla by treatment with 4 N NaOH. The percentage content of sulfur in the separated cortex was 3.6, that in the medulla 0.23. It is suggested that the medulla is substantially free from sulfur. It is suggested that keratin may contain 1 cysteine residue to 5 other amino acid residues.

The hemicelluloses of mesquite wood, L. Sands and W. Y. Gary (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 573–581*).—The hemicellulose of mesquite wood was isolated at the University of Arizona and shown to be a mixture of two polyxylonomethoxyuronides. The hemicelluloses were hydrolyzed and the hydrolytic products studied, with the result that no such relationship between the hemicelluloses and the mesquite gum as would indicate that one is the precursor of the other could be established.

The ribosephosphoric acid from yeast adenylic acid, P. A. Levene and S. A. Harris (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 419–429, fig. 1*).—"It has been found that yeast adenylic acid is readily deaminized into inosine-

phosphoric acid, and this in turn is readily hydrolyzed in aqueous solution at its own pH to a ribosephosphoric acid. This acid was then compared with that obtained from xanthylic acid, and the two were found identical with respect to their rotation in aqueous solution, with respect to the effect of the presence of borax on their optical activity, and, finally, with respect to their rates of hydrolysis by mineral acids. Thus, the ribosephosphoric acid obtained from yeast adenylic acid is *d*-ribose-3-phosphoric acid."

The synthesis of aspartic acid, M. S. DUNN and S. W. FOX (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 493–497*).—It is shown in a contribution from the University of California that analytically pure aspartic acid may be conveniently and inexpensively synthesized from diethyl fumarate and alcoholic ammonia through the intermediate diketopiperazine diacetamide and copper aspartate. One mol (172 g) of the ester yielded 78 g of the finely purified amino acid, or 59 percent of the theoretical quantity.

Sullivan's reaction for the quantitative determination of cysteine and cystine, J. W. H. LUGG (*Biochem. Jour., 27 (1933), No. 3, pp. 668–673*).—Amino acids other than cysteine, present in the sample solution but not in the cysteine standard, were found to produce a yellow color interfering with color matching and to cause a varying loss of intensity of the red color measured as the index of the cysteine content, the last named interference being attributed to buffering effects. The author, therefore, so modified the original form of the Sullivan method (E.S.R., 70, p. 444) as to keep the pH values in both sample and standard the same at the same stages of the determination, and added to both standard and sample solution enough of an amino acid not cysteine so that the amino acid effect was the same in both solutions. These two objects were attained together by adding glycine with suitable quantities of sodium hydroxide.

The reagents required are: "(A) N NaOH solution; (B) M glycine buffer in 0.4 M tertiary sodium citrate—7.5 g of glycine and 14.3 g of the salt $C_6H_5O_7Na_3$, 5.5 H_2O, are dissolved in 50 cc of water + 25 cc of solution A and diluted to 100 cc; (C) M NaCN solution in 0.1 N NaOH solution; (D) 0.02 M solution of sodium 1:2-naphthoquinone-4-sulfonate; (E) 0.5 M Na_2SO_3 solution in 0.5 N NaOH solution; (F) 2.5 N NaOH solution; (G) 0.1 M $Na_2S_2O_4$ solution in 0.5 N NaOH solution. Solutions B and C may not be mixed and stored as one, because a slow reaction proceeds, leading to the development of a brown color not removed by $Na_2S_2O_4$. Solutions A, B, E, and F may be stored for months in well-stoppered bottles. Solution C may be kept for several weeks. Solutions D and G must be prepared immediately before they are required."

The determination of cysteine and cystine, when either cysteine or cystine alone is present, is thus described: "An aliquot (a cc) of the unknown solution, containing preferably between 1 and 2 mg of cystine or 0.5 and 1 mg of cysteine, is titrated with b cc solution A (or F if necessary) to pH 9.5 using thymol blue indicator. This mixture is titrated with solution F (c cc) to about pH 12.5 using orange G.G. (alizarin yellow R is hardly satisfactory because its range does not extend much above pH 12.0). Five cc of solution B and 2 cc of solution C are transferred to a 25-cc stoppered cylinder; b cc of solution A (or F, if used) are added and followed by $5-a-b$ cc of water. The contents are mixed, and a cc of the unknown solution are added. The contents are thoroughly mixed and are then allowed to react for 10 min. Solution D is made up during this interval, and 1 cc of the fresh solution D is added to the contents of the cylinder, which are again mixed. After a further interval of 5 min., 5 cc of solution E are added and mixed and are followed by $1-c$ cc of water and then by $5+c$ cc of solution F. The cylinder's contents are again thoroughly mixed and allowed to react for 20 min. Five min. before this period is completed,

solution G is prepared, and, at the conclusion of the 20-minute interval, 1 cc of solution G is added, and the contents of the cylinder are again mixed. After standing for 10 min., the solution is ready for colorimetric comparison with a cystine standard similarly prepared at the same time and between 0.7 and 1.5 times as intense in color. The maximum safe red color intensity is that obtained with 3 mg of cystine. Solutions must be allowed to stand in the colorimeter cups with plungers immersed approximately to the right depths for at least 3 min. before final readings are taken, and these should be completed within 30 or 40 min. of adding solution G. With the standard containing s mg of cystine and set at y mm in the colorimeter and with the unknown matching at x mm, the unknown will contain sy/x mg of cystine or $121sy/240x$ mg of cysteine."

Ferric salts were found to interfere seriously when present in sufficient concentrations, but errors from this source are believed unlikely to exceed from 1 to 2 percent in the cases of ordinary tissue hydrolysates. It was found also that the initial color of the sample solution may add to the final color as measured. Errors from this source could be reduced or eliminated by color compensation methods.

Note on the formaldehyde titration of milk-protein, and its application to the estimation of caseinogen, G. T. Pyne (*Biochem. Jour., 27 (1933), No. 3, pp. 915–917*).—It was found that the factor for converting the formaldehyde titration into milk protein shows a progressive increase throughout the lactation period, "which appears to arise immediately from a similar but more marked increase in the whey-protein factor and to be ultimately attributable largely to variations in the composition of the nonprotein nitrogen." It was possible, however, to adapt the formaldehyde titration method to the estimation of caseinogen.

Amino acid nitrogen in blood and its determination, I. S. Danielson (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 505–522*).—The limitation of the range of true proportionality in the determination of amino nitrogen by the Folin method (E.S.R., 47, p. 410) was traced to the presence of a strong blank caused by the incomplete bleaching of the excess quinone reagent. The author found it also necessary to make the color standard from both glycine and glutamic acid, instead of from glycine alone, in order to produce a standard color of a shade capable of being more nearly matched by that developed in the sample solution. A 1.5 percent borax solution was used in place of the original sodium carbonate solution because the first-named source of alkali lessened the blank. The excess of the β-naphthoquinonesulfonic acid reagent was bleached by means of an approximately 0.1 M sodium thiosulfate solution, used in conjunction with a reagent, designed to prevent sulfur precipitation from the thiosulfate, which consisted of 3 volumes of 1.5 N hydrochloric acid, 1 volume of glacial acetic acid, and 4 volumes of approximately 0.15 M formaldehyde. The acetic acid in the last-named reagent was required to prevent the appearance of a cloudiness in solutions containing tryptophan. The modified method is given in full working detail.

Notes on a Shaffer-Somogyi copper reagent, V. J. Harding and C. E. Downs (*Jour. Biol. Chem., 101 (1933), No. 2, pp. 487–492*).—The effect of alteration of the carbonate: bicarbonate ratio on the reducing value of a series of sugars, and of some other reducing substances, is shown. An interference by ammonium salts with sugar determinations effected by means of the above reagents is described, together with a method for the removal of ammonium salts without alteration of sugar values.

A new method for the determination of cellulose, based upon observations on the removal of lignin and other encrusting materials, A. G.

NORMAN and S. H. JENKINS (*Biochem. Jour.*, *27* (*1933*), *No. 3*, *pp. 818–831*).—The authors believe that "the cellulosans or polysaccharide material very intimately associated with 'pure' cellulose in nearly all natural celluloses should remain intact in any satisfactory method of cellulose estimation." They find alkaline pretreatment objectionable in that a portion of the cellulosan is removed, even though delignification is much assisted. Alternate preliminary treatments with alkali and acid were found to result in a very severe loss of cellulosan, and the product was incompletely delignified by the subsequent treatments with neutral hypochlorite. In the chlorination methods of cellulose determination the chlorine is believed to be at least as important in causing the solution of hemicelluloses during the subsequent treatment with boiling sulfite as in assisting in the removal of lignin. "Sulfite alone results in extensive, but not complete, delignification without heavy loss of encrusting polyuronide hemicelluloses. Neutral hypochlorite treatments followed by sulfite boilings will effect a fairly complete delignification of plant materials."

A new method, for both straws and woods, is proposed. This involves first two treatments with neutral hypochlorite and then three or more with acid hypochlorite, each followed by boiling with sodium sulfite. "The results obtained are almost identical with those obtained by the Cross and Bevan method [E.S.R., 39, p. 614] without pretreatment. The proposed method is more rapid with straws in that it involves fewer treatments. It is readily applicable to large scale preparations.

"The products from cereal straws given by both the Cross and Bevan and the new methods are not entirely free from lignin. The lignin figure obtained by the use of 72 percent H_2SO_4 on such products is, however, not accurate, since appreciable quantities of apparent lignin are produced from the cellulosan when pentose in nature. Upon removal of this fraction by acid hydrolysis the lignin figures are reduced by a quarter to a third, the residue being unaffected by overchlorination. It must therefore be either true lignin, very tenaciously held, or else some other resistant material of unknown composition. In view of the production of apparent lignin from pentosan groupings by 72 percent H_2SO_4, the figures obtained for lignin on many natural materials may be unreliable. A brief preliminary acid hydrolysis of straws results in the lowering of the apparent lignin content by 25–30 percent. Hardwoods similarly are likely to give figures which are too high."

The local detection and quantitative determination of chlorophyll in the various parts of plants [trans. title], S. HILPERT and H. HOFMEIER (*Ber. Deut. Chem. Gesell.*, *66* (*1933*), *No. 10*, *pp. 1443–1445*, *figs. 2*).—When parts of plants were heated in a 5-percent aqueous solution of SO_2 in the presence of small amounts of Cu salts in a brass container to 100° C. for from 1 to 2 hr. on the places where chlorophyll had been present, an insoluble green compound presumed to be Cu-phaeophytin was formed. All other yellow pigments were removed by the solution, and the green coloration showed the places where chlorophyll had been present. Even partly decolorized decomposition products of chlorophyll gave the reaction. The method was found also to be applicable for the quantitative determination of chorophyll by the use of a photometer and a standard solution of Willstätter's K-chlorophyll.

A simplified method for the rapid determination of lead residues on apples, D. E. H. FREAR and D. E. HALEY (*Pennsylvania Sta. Bul. 304* (*1934*), *pp. 8*, *figs. 3*).—The photo-electric nephelometer described consists essentially of a suitable electric source of light, with control resistance, the filament being centered over a Nessler tube about 25 cm in length and 3 cm in outside diameter and a suitable photo-electric cell centered directly below the Nessler tube and connected to a microammeter of a capacity of from 100 to 200 micro-

amperes. A drawing and photograph show these elements with the supporting and enclosing arrangements used by the authors. The source of light used was a 32–32 candlepower automobile headlight bulb, the filaments connected in series through a variable resistance to a 12-v battery.

"The instrument is standardized by taking definite amounts of a solution of C.P. lead acetate corresponding to 0.005, 0.01, 0.015, and 0.02 grain of lead per pound of the apples to be analyzed. When using an aliquot of the washings representing 140 g of apples, as will be described later, the corresponding amounts of lead are 0.0001, 0.0002, 0.0003, and 0.0004 g. To these solutions are added 0.25 g of sucrose and 10 ml of concentrated sulfuric acid. Each of these solutions is boiled until the organic matter chars, and 5-ml portions of concentrated nitric acid are added until, after boiling, the solution appears clear and colorless and has a volume of approximately 10 ml.

"This solution is diluted when cold with 50 ml of distilled water and again allowed to cool, and neutralized with 40 ml of a solution containing 913 ml of concentrated ammonium hydroxide, 5 g of potassium cyanide, and 31.3 g of citric acid per liter of solution. When cooled to room temperature, this solution is placed in the Nessler tube, made to 100 ml, thoroughly mixed, and the tube is placed in position in the instrument. The light is adjusted by means of the rheostat so that the microammeter reading is at the maximum of the instrument. Six drops of a 10 percent solution of sodium sulfide are then added, and the whole mixed and returned to the colorimeter. The reading is taken and a graph prepared, plotting the readings in microamperes against lead concentration in grains per pound. . . .

"For the determination of lead in spray residues, a 700-g sample of apples or other fruit to be analyzed is washed with a solution containing 3 percent by volume of concentrated hydrochloric acid and 1 percent of sodium chloride. Each fruit is immersed in the solution for 2 min. at a temperature of approximately 95° C. When removed, the calyx and stem ends are thoroughly scrubbed with a rubber policeman and rinsed well with an additional portion of the hot wash solution.

"After each fruit in the sample has been washed, the combined washings are transferred to a 500-ml volumetric flask and made to volume when cool. *Aliquot portions of this solution may be used for the determination of arsenic* by the modified Gutzeit method. For the lead determination, an aliquot is taken, and the organic matter is digested with sulfuric acid and nitric acid. The amount of lead present determines the volume of the aliquot taken. For residues containing less than 0.02 grain of lead per pound of apples, an aliquot of 100 ml, representing 140 g of apples, is satisfactory. The remainder of the procedure is carried out as described in a preceding paragraph. When the final reading is obtained, comparison with the graph (obtained by standardizing the instrument) indicates the amount of lead directly." It was necessary to avoid or allow for temperature changes, which were found to affect the output of the cell, especially when an instrument of low resistance was used in the circuit. "When the temperature of the instrument is subject to variation, separate calibration curves may be made at various temperatures."

AGRICULTURAL METEOROLOGY

Progress of meteorology and its application in the United States (*Bul. Amer. Met. Soc., 15 (1934), No. 4, pp. 102, 103*).—Brief reference is made to a report, by the Section of Meteorology of the American Geophysical Union, at the Lisbon meeting of the Union of Geodesy and Geophysics, on Meteorology in the United States during the Period 1929 to 1932, Inclusive. In this report

it is stated that the chief developments in meteorology in the United States, as far as the Weather Bureau is concerned, have been in practical applications and in the collection of basic data for fundamental investigations, including especially weather reporting by radio from ships at sea, aeronautical observations, investigations in agricultural meteorology, and fire-weather forecasting. "Work in agricultural meteorology has included several investigations, the most important of which were on the influence of weather on the yields of cotton and corn, the probabilities of droughts, and trends of precipitation and temperature. There is a regrettable absence of detailed phenological data."

Monthly Weather Review, [January-February, 1934] (*U.S. Mo. Weather Rev., 62 (1934), Nos. 1, pp. 37, pls. 15, figs. 14; 2, pp. 39–76, pls. 12, figs. 16*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 1.—Atmospheric Ionization near the Ground during Thunderstorms, by G. R. Wait and A. G. McNish (pp. 1–4); Methods and Results of Definite Rain Measurements.—III, Danzig Report, by H. Koschmieder (pp. 5–7); Temperature Variations along a Forested Slope in the Bent Creek Experimental Forest, N.C., by L. T. Pierce (pp. 8–12); The Great Duststorm of November 12, 1933, by M. R. Hovde (pp. 12, 13); The Dustfall of November 12–13, 1933, by E. R. Miller (pp. 14, 15); Petrology of the Great Dustfall of November 13, 1933, by A. E. Alexander (p. 15); and Mount Washington Observatory, N.H., Progress Report, by S. Pagliuca (pp. 16–18).

No. 2.—Marked Summer Air-Mass Displacements in California and Their Effects on Weather, by A. W. Cook (pp. 39–45); Some Results of Sounding-Balloon Observations during the Second International Polar Year, August 1932 to August 1933, Inclusive, by J. C. Ballard (pp. 45–53); The Effect of Temperature on the Pressure Elements of the Friez Aerometeorograph, by J. C. Ballard and W. B. Drawbaugh (pp. 53, 54); Battle of the Chinook Wind at Havre, Mont., by F. A. Math (pp. 54–57); The January 1934 Cold Wave on Mount Washington, N.H., by S. Pagliuca (pp. 57, 58); Storms over the Northeast Pacific Ocean and Adjacent Land Areas in December 1933, by R. C. Counts, Jr. (pp. 58, 59); An Unusual Solar Halo at Portland, Oreg., February 15, 1934, by W. H. Woodward (p. 59); and Tornadoes in Lauderdale County, Miss., Sunday, February 25, 1934, by E. E. Unger (pp. 59–61).

Is our climate changing to milder? J. B. Kincer (*Sci. Mo., 39 (1934), No. 1, pp. 59–62*).—Evidence is presented which indicates that during the last 25 years especially there has been a trend toward higher temperatures in this country and in other parts of the world. See also an article previously noted (E.S.R., 70, p. 744).

A new rainfall map of the world [trans. title], W. Meinardus (*Petermanns Mitt. Justus Perthes' Geogr. Anst., 80 (1934), No. 1, pp. 1–4; rev. in Nature [London], 133 (1934), No. 3367, p. 719*).—Unlike most previous maps, this map shows, in colors on a scale of 1 : 100,000,000, the mean annual distribution of rainfall over land and sea. A particularly striking feature is the low precipitation in north and south polar regions. Another feature of special interest is the distribution over the Indian and Pacific Oceans.

Climatological data for the United States by sections, [1933] (*U.S. Dept. Agr., Weather Bur. Climat. Data, 20 (1933), No. 13, pp. [243], pls. 2, figs. 25*).—Summaries are given of climatological data for each month of 1933 and for the year as a whole for each State.

Meteorological observations, [March-April 1934], C. I. Gunness and H. Jenkins (*Massachusetts Sta. Met. Ser. Buls. 543–544 (1934), pp. 4 each*).—

The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Notes on the climate of the Philippines [trans. title], J. U. C. GERHARD SCHINDLER (*Met. Ztschr. [Braunschweig], 51 (1934), No. 4, pp. 155, 156*).—The characteristic features of temperature, precipitation, humidity, and air pressure, based on observations in sugar-growing districts of the Philippines, are briefly described.

SOILS—FERTILIZERS

Guide for the experimental study of the soil, A. DEMOLON and D. LEROUX (*Guide pour l'etude experimentale du sol. Paris: Gauthier-Villars & Co., 1933, pp. VI+214, figs. 72*).—In their prefatory note the authors emphasize the importance of the experimental approach to the study of the soil, calling attention to the fact that the manipulative experience of beginners is too often limited to a few quantitative analyses. It is noted that the examination of profiles, mechanical analyses, the movements of water, the colloids, and the microbiology of the soil provide experimental material, at once abundant and suggestive, which too frequently remains neglected. The book has the purpose of providing a course in experimental soil science of more adequate scope; and at the same time of serving the investigator in some measure as a reference manual, and of making generally available a number of teaching experiments, hitherto unpublished, which were devised by A. T. Schloesing.

The first, or general part, contains chapters on the securing and preparation of a soil sample for experimental study, the constitution of the soil, an introduction to the study of the soil colloids, the clay colloids of the soil, soil organic matter, the sandy constituent of the soil, lime, and physical and mechanical analysis of the soil; part 2, under the general caption physics of the soil, deals with general properties and with relations between water and the soil; part 3, on the chemistry of the soil, takes up soil reaction, the absorbing power of the soil, and the soil solution; and part 4, on the biology of the soil, considers, first the soil atmosphere, second, the carbon cycle, and, third, the nitrogen cycle. An appendix contains additional methods of chemical analysis.

The application of heat of wetting measurements to soil research problems, H. JANERT (*Jour. Agr. Sci. [England], 24 (1934), No. 1, pp. 136–150, figs. 4*).—Experiments carried out at the Rothamsted Experimental Station with pure singlebase clays showed that the heat of wetting represents a specific proportion of the heat of hydration of the adsorbed cations in their free state. Correlations between the heat of wetting and various other soil properties determined in the field or by laboratory methods were demonstrated. Wetting with organic liquids produced a heat effect proportional to the water heat of wetting for mineral soils; but "the dipole moment and the molecular volume of a liquid do not seem to determine completely the heat of wetting of a given soil in it."

The use of the glass electrode in soil reaction and oxidation-reduction potential measurements, S. G. HEINTZE (*Jour. Agr. Sci. [England], 24 (1934), No. 1, pp. 28–41, figs. 3*).—The glass electrode with an electrometer triode valve as amplifier gave accurate pH measurements on soil suspensions and on soil crumbs moist enough to wet the glass. It is pointed out that it has the merit of being applicable to strongly oxidizing or reducing systems and to alkaline soils, but it is believed to have little advantage over the quinhydrone electrode "where this is known to be reliable." The glass electrode appeared to provide a satisfactory reference electrode in oxidation-reduction potential measurements, inasmuch as "it allows both E_h and pH measurements without alteration to the system, while its high resistance minimizes polarization."

Oxidation-reduction potentials of soils are considered to "depend so closely on the pH value of the soils that they should not be considered separately. For constant pH values highly contrasted soil types may give similar oxidation-reduction potentials. After water-logging in the laboratory for 1 or 2 days, there is a marked fall in potential for soils known from the conditions of their formation to contain organic matter capable of rapid decomposition as soon as moisture, temperature, and soil reaction become favorable. In the main soil zones of European Russia, this change on water-logging reaches its maximum in the chernozem belt."

[Soil and fertilizer studies at the Arkansas Station] (*Arkansas Sta. Bul. 297 (1934), pp. 70, 71, 116–120*).—In this summary of work carried on by the station since its establishment, the effect of irrigation on rice soils and the utilization of fertilizer elements, including the effect of potassium and phosphatic fertilizers, are discussed in some detail.

[Soil and fertilizer investigations of the Iowa Station] (*Iowa Sta. Rpt. 1933, pp. 94–111, figs. 2*).—Data are briefly reported on the effects of fertilizing materials and methods of grazing on soil conditions and plant growth on permanent pastures, by P. E. Brown, H. R. Meldrum, A. J. Englehorn, and J. L. Boatman; effects of various amounts of fertilizers applied at different times in the rotation on the crops and soil conditions in the Wisconsin drift soil area, by Brown and Boatman; effects of various amounts of limestones of different degrees of fineness on the Tama silt loam, by Brown, R. H. Walker, and R. E. Bennett; the relative value of red clover, alfalfa, and sweetclover as soil-building crops, by Brown and Boatman; effects of various fertilizing materials on crop growth on the Carrington loam and the Clarion loam by Meldrum and Bennett, on the Shelby loam and the Grundy silty clay loam by Englehorn, on some terrace and bottom land soils by Meldrum and Englehorn, on the Tama silt loam and the Webster soils by Meldrum, Englehorn, and Bennett, on the Carrington silt loam and the Clinton silt loam by Englehorn and Bennett, and on the Marshall silt loam by Meldrum; the value of commercial cultures for the inoculation of legumes and nonlegumes and fixation of atmospheric nitrogen by nonsymbiotic micro-organisms, both by Walker; effects of fertilizers and various soil treatments on micro-organisms, by Brown, F. B. Smith, and Walker; nitrate assimilation in soils and occurrence and activities of soil fungi in Iowa soils, both by Smith; physiological studies on *Rhizobium* and effects of lime and legume inoculation on crops and on soil conditions in southern Iowa, both by Walker; plant food content and lime requirements of Iowa soils and the composition of red clover, by Brown, Englehorn, and Bennett; base exchange in Iowa soils, by Walker; the available phosphorus in Iowa soils and humus investigations—the formation of humus and the decomposition of organic matter in soils, both by Smith; soil erosion on Marshall silt loam in Page County, Iowa, by Brown, J. B. Davidson, and H. D. Hughes; and character and management of the alkali soils of Iowa, by Brown, Boatman, and Smith.

[Soil and fertilizer studies in Louisiana] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 13, 15–17*).—The report contains brief statements on results of recent studies on the use of lime on strawberries, the harmfulness of calcium arsenate to rice, the effect of flooding on the state of oxidation of rice soils, and the effect of organic matter on the response of phosphoric acid and potash on rice.

[Soil and fertilizer research by the Massachusetts Station] (*Massachusetts Sta. Bul. 305 (1934), pp. 9, 11, 15, 16, 48, 49, 50.*)—Comparisons by A. B.

Beaumont of the newer nitrogen fertilizers; experiments on the magnesium requirement of crops, by Beaumont and M. E. Snell; methods for determining magnesium deficiency in soils, by J. L. Haddock; the application of the *Azotobacter* soil plaque test for determining mineral deficiencies in Massachusetts soils, and the calcium metabolism of nitrogen-fixing bacteria, both by J. E. Fuller; nitrogen fixation in the presence of or as a result of the growth of legumes versus nonlegumes under certain defined agronomic conditions, and a study of the availability of soil potash with the object of developing a system of diagnosis for the soils of the State, by F. W. Morse, are among the topics reported.

[Soil and fertilizer investigations of the Nevada Station], G. Hardman, R. Stewart, and V. E. Spencer (*Nevada Sta. Rpt. 1933, pp. 18–20*).—Items of the station's soil investigation program (E.S.R., 67, p. 367) here briefly noted include studies in the reclamation of certain desert soils under irrigation from artesian wells in the Las Vegas Valley, in which are shown the need for heavy phosphating to maintain the fertility of desert lands brought under cultivation and the inclusion of alfalfa in the rotation to counteract the tendency of the soils in question to grow tight under continuous cropping; an attempt to prepare "humus-free" soils; and a study of the development of new forms of phosphorus fertilizers for use on so-called "slick spots", impermeable areas in the gypsum soils and allied soils of the Moapa and Las Vegas Valleys, and of the water supply of this area.

[Soil Survey Reports, 1929 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 23, pp. 27, fig. 1, map 1; 26, pp. 31, fig. 1, map 1*).—The two surveys here noted were carried out in cooperation with the respective State experiment stations.

No. 23. *Soil survey of Craven County, North Carolina*, R. C. Jurney et al.—Craven County, in eastern North Carolina, is an area of some 447,360 acres of which the general surface is nearly level, and "in the large flat areas natural drainage has not been established."

The 15 soil series occurring in the tract examined are divided into 28 types. Portsmouth fine sandy loam, one of the group of "dark-colored or black poorly drained soils, and organic soils", forms 11.3 percent of the county. Swamp covers 9 percent of the county and muck and marsh 9.1 percent.

No. 26. *Soil survey of Greenwood County, South Carolina*, F. R. Lesh et al.—Greenwood County, in northwestern North Carolina, consists of 292,480 acres of lands ranging in surface features from flat upland areas to hilly and broken tracts.

Cecil clay loam forms a total of 27.1 percent of the county, but 6.6 percent out of this total constitutes a broken phase, useless for agricultural purposes because of extensive soil washing and gullying. Cecil sandy loam, 4 percent, together with a mixed phase, 10.5 percent, of the same soil, covers a further 14.5 percent of the county; and Wilkes sandy loam, the greater part of which "is really unfit for general farming, as it is subject to continued erosion and is too uneven in surface relief to be economically handled," occupies 11.1 percent. The soils classified are divided into 13 series inclusive of 16 types. Of nonagricultural areas, only meadow, 8 percent, is listed unclassified, but a further "25 percent [approximately] of Greenwood County comprises first bottom land, broken phases of the clay loam soils, and Wilkes sandy loam. All these areas, under present economic conditions, are unsuited for general farming purposes."

[Soil Survey Reports, 1930 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 15, pp. 42, figs. 3, map 1; 17, pp. 35,*

figs. 2, map 1; 19, pp. 35, pls. 2, figs. 2, map 1).—The three reports here noted cover surveys made with the cooperation, respectively, of the California, Iowa, and Virginia Experiment Stations.

No. 15. *Soil survey of the El Cajon area, California*, R. E. Storie and E. J. Carpenter.—The El Cajon area occupies 387,200 acres at the southwest corner of the State. The area includes the agriculturally valuable and much of the rougher parts of a mountainous highland district and of an adjacent region of coastal-plain mesas. The wide variety of the soils of the area is represented in 29 series containing 31 types, Redding gravelly sandy loam, the most extensive, occupying 16.7 percent of the acreage surveyed. The nonagricultural parts of the area comprise 5.7 percent of rough broken land, rough stony land 23.5 percent, and coastal beach, dune sand, river wash, and made land totaling 2 percent.

No. 17. *Soil survey of Washington County, Iowa*, C. L. Orrben and W. H. Buckhannan.—Washington County, in southeastern Iowa, possesses 362,240 acres of lands, forming for the most part an undulating to rolling plain, well drained by the Iowa and Skunk Rivers. Its soils are grouped into 17 series in which are included 23 types. Grundy silt loam, " regarded as one of the best corn soils in the county ", occupies 22.9 percent of the total acreage. Clinton silt loam, especially valuable as a small grain soil, covers a further 20 percent, and Tama silt loam 15 percent.

No. 19. *Soil survey of Grayson County, Virginia*, R. E. Devereux and G. W. Patteson.—An area of 288,640 acres in southwestern Virginia, Grayson County consists of a deeply cut plateau broken by mountains and large hills. The soils form 12 types, which are here grouped into 9 series. Porters loam takes up 27.3 percent of the county. Ashe loam follows with 27.1 percent; and Ashe stony loam, with reference to which it is noted that " in . . . other States land with such topography has been classed as rough stony land ", constitutes 14.9 percent. Muskingum stony loam, steep phase, 1.7 percent, is also rough stony land.

Peat, muck, and mud deposits: Their nature, composition, and agricultural uses, F. T. Shutt and L. E. Wright (*Canada Dept. Agr. Bul. 124, n.ser.* (*1933*), *pp. 27, figs. 11*).—" Among naturally-occurring materials of value for the improvement of soils may be numbered peat, swamp or black muck, river, pond, mussel and marsh muds, and similar deposits from both fresh and salt water. . . . As a supplier of humus-forming material and nitrogen (largely inert), peat and swamp muck find their chief function and value, while the several classes of ' muds ' are perhaps more particularly useful for their mineral content [chiefly calcium carbonate] and their influence on the texture or tilth of the soil to which they may be applied."

The bulletin contains a brief general description of peat and muck deposits and of their formation. It discusses their occurrence in Canada, and their composition, treatment, and agricultural uses, the reclamation of peat and muck lands, and the handling and use of tidal, mussel and oyster shell, and other muds.

Studies in tropical soils.—III, The shrinkage behaviour of lateritic and kaolinitic soils, F. Hardy (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 1, pp. 59–71*).—Paper No. 3 of this series (E.S.R., 68, p. 294) reports upon the comparative results of the determination of Haines' shrinkage constants (E.S.R., 54, p. 15) and of certain soil moisture constants for a series of clay soils representative of the three important classes, tropical red soils (derived from igneous rocks and from limestone), kaolinitic soils and materials, and gray and yellow soils (mainly derived from aqueous sedimentary rocks). A tenta-

tive interpretation of the data in terms of the microreticular hypothesis of soil colloidal structure and a possible explanation of the physical significance of some of the constants measured, particularly sticky point moisture, loss on ignition, water uptake from aqueous vapor, and Haines' "residual shrinkage" moisture content, are offered.

"The results indicate that tropical red soils closely resemble kaolinitic materials in their shrinkage behavior and moisture relations, but that they are intermediate between this type and gray and yellow soils, which exhibit characteristic high total shrinkage, marked residual shrinkage, and high adsorptive capacity for moisture and for cations." A brief review of recent work on the mineralogy of clay minerals (based upon X-ray analysis and optical examination) is offered in support of these findings. The need of detailed mineralogical investigations of the products of weathering of rocks under humid tropical conditions is urged.

The relationships between sticky point, moisture equivalent, and mechanical analysis in some Australian soils, J. A. Prescott and H. G. Poole (*Jour. Agr. Sci. [England], 24 (1934), No. 1, pp. 1–14, figs. 5*).—The experience of the present authors within the range of the group of Australian soils studied "confirms in general previous findings regarding the additive character of the moisture equivalent. . . . The moisture equivalent contribution of organic matter would appear to lie in the neighborhood of 130 percent for the three most reliable cases examined (132 for peaty soils, 130 for mallee soils, 127 for podsols). The clay contribution is much more variable, and accounts for the relatively low multiple correlation obtained with basaltic soils where the largest discrepancies between observed and calculated values can generally be related to the clay fraction. For soils with appreciable quantities of exchangeable sodium the moisture equivalent values are high and may be difficult of actual determination. . . .

"The values for sticky point are closely related to those for moisture equivalent only in straightforward cases. This is probably due to the fact that the moisture equivalent values for normal calcium-hydrogen clays are probably very close to the sticky points for the same material, whereas the organic matter appears to contribute proportionately much more to the sticky point than it does to the moisture equivalent. . . . Apparently also the moisture equivalent is much more affected by the proportion of replaceable sodium in the exchangeable bases than is the sticky point, and this reduces the correlation between the two single values. . . . The contribution to the sticky point by the noncolloid fraction is much more variable than has frequently been assumed and depends on the relative proportions of coarse sand, fine sand, and silt, values ranging from 29 to 12 percent having been observed. As the amount of colloidal material in the soil increases the first effect is the filling up of the pore space associated with a falling sticky point; when the amount of colloidal material reaches the equivalent of about 10 percent of clay the sticky point begins to rise in proportion to the colloidal content. The influence of the original pore space may frequently be traced with soils containing as much as 40 percent of clay, although the relationship is difficult to express quantitatively without further data.

"It would appear probable that when the full interrelationships between these two single values and the mechanical analysis has been worked out for a group of closly related soils in association with a soil survey, the two values alone or in combination may be able to throw considerable light on the physical properties of any soil from within this group."

The formation, evolution, reclamation, and the absorbed bases of alkali soils, W. P. Kelley (*Jour. Agr. Sci. [England], 24 (1934), No. 1, pp. 72–92*).—

The author of this contribution from the California Experiment Station directs attention to the calcium combinations present in alkali soils as a factor to be considered in conjunction with the soluble salts and the base-exchange constituents. "The amount and kind of calcium minerals in the soil predetermine both its evolutionary trend and the method of reclamation that should be employed." A part of the conclusions reached are thus stated:

"Under certain conditions alkali soils tend to pass through four evolutionary stages, namely, salinization, alkalinization, desalinization, and degradation." Whether or not an alkali soil will pass beyond the salinization stage is thought to depend on the composition of the soluble salts that accumulate in it. Where sodium salts predominate, more or less alkalinization of the exchange complex is to be supposed to have taken place, except where soluble calcium is relatively abundant.

"Desalinization (by leaching, whether natural or artificial) of alkalinized soil is usually accompanied by the formation of Na_2CO_3 and by pronounced deflocculation. If $CaCO_3$ be present, the formation of Na_2CO_3 is accompanied by the replacement of absorbed sodium by calcium. Under these conditions the degradation stage will not be attained. If $CaCO_3$ be absent, base-unsaturated constituents arise under leaching conditions, and more or less of the inorganic-exchange complex becomes decomposed into simple oxides.

"The evolutionary stage of the soil predetermines, in considerable measure, what reclamation process should be employed. If the soil has not passed beyond the salinization stage, simple leaching will effect satisfactory reclamation. . . . If the exchange complex has become alkalinized to any important extent, the absorbed sodium must be replaced by calcium," either by treating the soil with a soluble calcium salt and leaching, or by reducing the hydroxyl-ion concentration of the soil to a point where calcium carbonate, if present, will react with the sodium-absorption compounds. "Experiments near Fresno, Calif., have demonstrated the effectiveness of gypsum and sulfur as treatments for strongly alkaline sodium soil. It has been found also that prolonged leaching will accomplish the reclamation of this soil. Upon leaching, $CaCO_3$ gradually reacts with the exchange complex of this soil, converting the same into calcium absorption compounds. The same result can be more quickly produced by applying sulfur, iron sulfate, alum, or other acid materials."

The effect of irrigation on soil salts at the Gezira Research Farm, Wad Medani, Sudan, H. Greene and R. H. K. Peto (*Jour. Agr. Sci. [England], 24 (1934), No. 1, pp. 42–58, figs. 2*).—An investigation was carried out at the Gezira Research Farm with the purpose of ascertaining whether subsoil salts move upwards under the influence of irrigation. It was found that the small apparent changes which occur under normal irrigation and cultivation are largely due to swelling and shrinking of the surface soil occasioned by changes in moisture content and to mechanical disturbance and settling which depend on cultivation. "Apart from these apparent changes there may be a small downward movement of salt through the soil material; there is no upward movement." When the salt content of the surface soil was increased by application of soil amendments or by other means, rains and watering rapidly washed down the salt, so that "in the course of time the soil column returns to its normal profile." Salts introduced by the irrigation water were also washed down from the surface layers. The observations recorded showed the increase in the average salt content of a 6-ft. column of soil to be roughly equivalent to the amount of salt introduced (about 1 ton per acre per 3 yr.).

The effects of rainfall and temperature on percolation through drain gauges, R. S. Koshal (*Jour. Agr. Sci. [England], 24 (1934), No. 1, pp. 105–*

135, figs. 8).—This contribution from the Rothamsted Experimental Station is essentially a mathematical analysis of the Rothamsted drain gage observations and their interpretation. Partial regression equations representing the average drainage observed in any months in terms of the temperature and rainfall of that month, and including terms representing the mean secular rate of change of the drainage discharge and of its regression coefficients on rainfall and temperature, were fitted to the 36 series of observations provided by the 3 Rothamsted drain gages in 12 mo.

An account of adequate and direct numerical methods of handling equations involving observed quantities, and chosen functions of them, as independent variates, and of the calculation of standard errors appropriate to the several sorts of comparison is given.

A note on the employment of a mixture of sand and calcium bentonite as the growth medium in pot culture and the establishment therein of a sward of perennial rye grass, A. W. GREENHILL and H. J. PAGE (*Jour. Agr. Sci.* [*England*], *23* (*1933*), *No. 3, pp. 329–334*).—A mixture of sand with 6 percent by weight of bentonite previously converted to the calcium clay was found a suitable medium in pot cultures for the growth of grass. "A good sward of perennial ryegrass was established in the medium by suitable watering, manuring, and cutting of the grass, within 11 weeks of sowing." The mixture allowed of easy control of the moisture content, and appeared to possess a moisture-retaining capacity comparable with that of a natural soil. It was shown to be almost totally deficient in both nitrogen and phosphoric acid, and markedly deficient in potash and in some of the less common elements necessary for plant growth.

"In view of the above properties and of the buffering action due to the presence of the bentonite, the mixture would appear to be suited to the more general study in pot culture of plant nutrition problems, and to offer several important advantages over either sand alone or natural soil for this purpose."

Morphological relationships of soil microbes, S. C. VANDECAVEYE and B. R. VILLANUEVA (*Jour. Bact.*, *27* (*1934*), *No. 3, pp. 257–269, fig. 1*).—Periodical microscopic counts on suspensions made from soil samples of 1,500 g maintained at normal moisture capacity at from 20° to 25° C. are reported in a contribution from the Washington Experiment Station. These experiments showed that the annual application of manure to Palouse silt loam over a period of 27 yr. has resulted in a marked increase in numbers in both the coccoid (autochthonous) and rod-shaped (zymogenic) organisms and to some extent in the numerical relationships between these two groups. The addition of 1 percent filter paper caused a large increase in numbers in the zymogenic group in the presence of readily available nitrogen. The increase in numbers and changes in numerical relationships resulting from the addition of organic substances were not commensurate with the increase in total microbial activity as measured by the liberation of carbon dioxide from the soil.—(*Courtesy Biol. Abs.*)

The decomposition of green manures in soil, J. A. DAJI (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 1, pp. 15–27, figs. 11*).—Four plant materials of widely different origin and age (young tares, young mustard, sugar beet tops, and mature mustard) were used as green manures, being mixed with soil for decomposition studies under laboratory conditions. The conditions of temperature, moisture, aeration, and microflora being optimal, the decomposition was found to depend upon the chemical constituents of the plant materials. It was indicated that the soluble carbohydrates, hemicelluloses, and cellulose are the compounds mainly responsible for the loss of total organic matter during decomposition. Plant materials containing "a balanced proportion of available carbohydrate compounds to available nitrogenous compounds" decomposed rap

idly. Those containing "excess of nitrogenous compounds" decomposed more rapidly and those containing a relatively large proportion of carbohydrate compounds *decomposed less rapidly. This is true in all cases whether the plant* material were that of a legume or of a nonlegume. Young plant materials, "by virtue of their abundance of available nitrogenous compounds", decomposed more quickly than did mature tissues.

When comparatively young plant materials are used as green manure "there is the danger of a loss of nitrogen, the loss depending upon the amount of total and available nitrogen this contains. Not only do they lose nitrogen but they decompose very rapidly with the result that nitrates accumulate soon after burial. Unless the succeeding crop is sown sufficiently early to utilize these nitrates, they are likely to be lost through leaching under field conditions."

The necessity for growing legumes on gray wooded soils, F. A. Wyatt (*Sci. Agr., 14 (1934), No. 6, pp. 327-335, figs. 2*).—Rotation and fertilizer experiments reported in this contribution from the University of Alberta revealed that the yields of wheat after oats were from 8 to 19 bu. less per acre than wheat after fallow for similarly treated plats, whereas the yields of wheat after oats were from 11 to 31 bu. less than wheat after clover plowed under. In the series of wheat after oats only two of the fertilizers gave increases above 9 bu. per acre, whereas four of the fertilized plats in the wheat after fallow series gave increases of approximately 13 bu. per acre, and five of the fertilized plats in the wheat after clover series gave increases of 20 bu. or more per acre. Similar increases were shown for the barley and oat crop. "The effect of the plowed-under clover was maintained at least into the second crop year."

The relation of the carbon-nitrogen ratio of a mulch to the accumulation of nitrates in soil, W. J. Moore, Jr., and A. B. Beaumont (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, p. 252*).—A note from the Massachusetts Experiment Station contributes further data supporting conclusions put forward in a previous publication (E.S.R., 70, p. 16) that nitrification in a mulch of waste hay and straw occurs "mainly in the lower layers of the mulch rather than in the soil, and only after the carbon-nitrogen ratio of the mulch had been considerably narrowed through processes of decay." Also "these data and those of the previous papers indicate that under the conditions of this experiment a period of about 3 yr. is necessary to reduce the carbon-nitrogen ratio of the mulch to the point where nitrates are produced in excess of the needs of the decay organisms. The upper limit of this ratio appears to be about 15: 1."

The absorption and assimilation of ammonic and nitric nitrogen by plants, A. B. Beaumont and W. J. Moore (*Com. Fert., 48 (1934), No. 4, pp. 10, 12, 14, 16, 18-20*).—The authors of this contribution from the Massachusetts Experiment Station review a considerable range of previously recorded work, finding, with reference to the relative utilization by plants of the two forms of nitrogen, that there are (1) wide differences between species, (2) differences due to the age of the plant, (3) variations with the pH value of the culture medium, (4) differences due to variations in the concentration of nutrients in the culture medium, (5) variations related to the number and proportionate concentrations of other ions present, and (6) differences due to variations in light effects.

Various hypotheses concerning the toxicity of ammonic nitrogen are discussed. "The present writers favor the view [supported by experiments carried out at the Massachusetts Experiment Station by Beaumont et al. (E.S.R., 66, p. 226)] that toxicity from ammonium salts of strong acids is due primarily to the accumulation of the NH_4 ions, or the NH_4OH molecule, rather than to physio-

logical acidity. A symptom of ammonia toxicity in nutrient solution cultures is the discoloration and decay of the roots. This did not occur with certain plants grown under sterile conditions. The hypothesis is advanced that these symptoms of decay are due to the attack of common micro-organisms, and that this attack is made possible by the narrowing of the C:N ratio through accumulation of unassimilated ammonium ions."

The fertilising value and nitrifiability of humic materials prepared from coal, E. M. Crowther and W. E. Brenchley (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 1, pp. 156–176, figs. 3*).—Humic acids and ammonium humates prepared by a mild oxidation of coal were examined with reference to their fertilizer value by means of laboratory nitrification experiments and in pot-culture tests on four soils, as well as in a number of field experiments on a range of soils and crops during one season. In none of the tests could the effects of ammonium humate be distinguished from those of ammonium sulfate of equal ammonium content. The nitrification tests and the pot cultures afforded some evidence of a slow production of nitrate or available nitrogen from the humic acid; but, in the field experiments as in the pots, there was no clear evidence of any fertilizer value apart from that due to the ammonium present.

"The close agreement between laboratory measurements on nitrate accumulation and yields and nitrogen contents of barley for seven treatments in four soils shows that the laboratory technic afforded an adequate measure of the availability of the fertilizer nitrogen."

Nitrogenous fertilizers for top-dressing field crops, A. T. Wiancko, G. P. Walker, and R. R. Mulvey (*Indiana Sta. Bul. 386* (*1933*), *pp. 23, figs. 4*).—The bulletin reports field fertilizer experiments designed to indicate the most profitable rates and times of application of nitrogen in various forms to wheat, corn, and hay crops.

Applications of from 15 to 20 lb. of nitrogen per acre produced increases of from 5 to 7 bu. of wheat per acre. Doubling these applications produced additional, but less profitable, increases. Smaller applications produced larger increases per pound of nitrogen used, but smaller total profits, indicating that medium applications are most practical. Nitrogenous top-dressings were found dependably effective for wheat, especially when such treatments were applied to the young crop. Such slow-acting materials as cyanamide required earlier spring applications than did sodium nitrate. Nitrogen treatments for corn, either at planting or as side-dressings, gave variable results and are not considered of practical value. Spring applications either of cyanamide or of sodium nitrate were markedly effective for timothy hay and pasture grass.

The readiness with which fertilizers in pellet form are evenly distributed is noted.

The influence of lime on the reaction of subsoils, A. W. Blair and A. L. Prince (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 5, pp. 469–473*).—Examinations of Sassafras loam samples from plats treated at 5-year intervals with limestone for 25 yr., and from plats of the same soil unlimed during that period, are reported in a contribution from the New Jersey Experiment Stations, both the upper 6⅔ in. and the layer from this depth to that of 13 in. having been investigated with a view to ascertaining the extent of the acidity correction in the lower layer as compared with that effected in the upper layer.

"With few exceptions the figures show that the subsoils from the unlimed plats gave pH readings only a little higher than the corresponding surface soils. In most cases there was very little difference between the pH values of the surface and subsoil from the limed plats. Both the surface and subsoil of these plats gave pH readings about 1.5 to 2 points higher than those of the

corresponding unlimed plats. It is thus established that in the case of this particular soil carbonate of lime used at the rate of 2,000 to 4,000 lb. to the acre over a period of 25 yr. has changed the reaction of the subsoil (6⅝ to 13 in.) to about the same degree that it has changed the reaction of the surface soil. It seems reasonable to conclude, therefore, that in general where generous applications of lime are made on acid soils, the acidity of the subsoil will also be gradually corrected."

Changes in composition of American fertilizers, 1880–1932, A. L. Mehring and A. J. Peterson (*U.S. Dept. Agr. Circ. 315 (1934), pp. 20, figs. 2*).—The changes that have occurred in the composition of fertilizers in the last 50 yr. were followed by examining and averaging more than a million published determinations, many of these averages being weighted on the basis of the tonnage consumed.

"The average complete mixed fertilizer in 1880 contained 2.3 percent of nitrogen, 8.9 percent of available phosphoric acid, 2.2 percent of potash, and 13.4 percent of total available plant food. In 1932 these figures were 3.4 percent of nitrogen, 9.5 percent of available phosphoric acid, 5.1 percent of potash, and 18 percent of total available plant food. Figures for intermediate years have been given, and show that most of the changes in composition have occurred in the last 10 yr. Like figures for phosphate and potash mixtures show that changes of similar character and extent have occurred in them also. In 1880 the average complete mixed fertilizer included 1.7 percent, in 1925, 0.6 percent, and in 1932, 0.8 percent more plant food than it was guaranteed to contain.

"In 1900 the nitrogen in all mixed fertilizers was derived 2.1 percent from ammonium salts, 6.9 percent from nitrates, and 91 percent from organic ammoniates. In 1931, 61.2 percent was derived from ammonia and its compounds, 11.6 percent from nitrates, 18.8 percent from organic ammoniates, and 8.4 percent from cyanamide and urea. . . .

"In 1880 practically no filler was used in mixtures. In 1931 the average content of filler in mixed fertilizers was 15.2 percent. If no filler had been used such fertilizer would have contained over 21 percent of plant food instead of 17.9 percent.

"The statistics collected in this study show that in some States very little change has been made in the average grade of fertilizers consumed, and that much filler is now used in mixtures. In other States, the average analysis of mixed fertilizers has steadily increased since 1920, and very little filler is used. The highest average analyses were found in those sections where farmers have only recently begun to use fertilizers."

Inspection of commercial fertilizers for 1933, T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 278 (1933), pp. 14*).—This bulletin records the usual analyses and other inspection data, and notes two important amendments to the State fertilizer law: (1) The label, in addition to the usual identifications, must certify the net pounds content of the package, and the guarantee is to be in whole number percentages of nitrogen, water-soluble potash, and available phosphoric acid. (2) "Complete" (three-element) fertilizers may not legally be sold or offered for sale if the total plant food content be less than 14 percent by weight.

AGRICULTURAL BOTANY

[Plant physiology studies by the Massachusetts Station], W. S. Eisenmenger (*Massachusetts Sta. Bul. 305 (1934), pp. 13, 14*).—Mention is made of methods used in an investigation of toxicity of aluminum for tobacco and

for various seedlings, and of the action of certain ions in the elimination o the toxic effects. The results are also given of a study of the distribution of nitrogen in infusions of decomposing plants.

Some factors influencing the germination of lettuce seed in seed laboratory practice, A. L. SHUCK (*New York State Sta. Tech. Bul. 222 (1934), pp. 21, fig. 1*).—The investigation was undertaken to determine what conditions should be set up for the germination of lettuce seed in laboratory seed-testing practice in order to avoid the tendency of certain lots of new crop seed to go into dormancy and thus conceal their true viability. For several months after harvest commercial lettuce seed was found to be in a physiologically unstable condition. An extensive series of experiments was undertaken to determine the effect of light, moisture, and temperature factors, singly or combined, on the completeness of germination of seed of different ages.

It was found that exposure to light frequently caused a marked increase in the germination of recently harvested seed. A 2-hour presoak in water at 20° C. gave no increase in blotter germination of such seed. Germination was more abundant where new seed was exposed to an ample supply of water. Prechilling for 6 days at 6° gave the most complete germination. Previous drying at 35° for 7 days, however, caused an increased percentage of dormancy. There was little difference between seed germinated at 20° and at 15°, but above this temperature new crop seed tended toward more dormancy whether placed under dry or moist conditions.

It is recommended that lettuce seed be germinated on moist blotters in the light at from 15° to 20°. If seed must be germinated in the dark, it is suggested that it be exposed previously, in a moist condition, to light for at least 2 hr.

Terminal and initial parenchyma in wood, F. W. JANE (*Nature [London], 133 (1934), No. 3362, p. 534*).—Parenchyma formation in the earliest growth in each annual ring is believed characteristic of *Cedrela odorata* and *Tectona grandis*, while parenchyma development in the last growth appears to be characteristic of *Swietenia mahogani*.

The significance of the compiler's data in field work, E. D. MERRILL (*Bul. Torrey Bot. Club, 61 (1934), No. 2, pp. 71–74*).—This is a plea for the use of field labels for recording practical information concerning specimens and to be attached directly to the herbarium sheet.—(*Courtesy Biol. Abs.*)

GENETICS

A bibliography of plant genetics, compiled by M. F. WARNER, M. A. SHERMAN, and E. M. COLVIN (*U.S. Dept. Agr., Misc. Pub. 164 (1934), pp. 552*).—Covering available literature through 1930, this comprehensive bibliography embraces 10,156 references, indicating those which have literature lists. Subject and author indexes are included.

The origin and behaviour of chiasmata.—VII, Zea mays, C. D. DARLINGTON (*Ztschr. Induktive Abstam. u. Vererbungslehre, 67 (1934), No. 1, pp. 96–114, figs. 21*).—The 10 paired chromosomes of corn, according to studies at the California Institute of Technology, form an average of 2.7 chiasmata at the prophase of meiosis in the pollen mother cells, and this number is reduced only slightly by fusion in terminalization, which is of the *Tulipa* type. The frequency of chiasmata in rings of four of known constitution and in the nucleolar chromosome indicates that the relation of the chiasmata to length is nonlinear as in *Stenobothrus*. The inferred chiasma frequency of individual chromosomes permits on the simplified chiasma-type hypothesis the prediction of the total corrected crossing-over length of each chromosome. The length

so far mapped genetically amounts to 46 percent of this estimate. Trivalents in trisomic plants were of the type found in *Tulipa* and had a higher chiasma frequency than the corresponding bivalents.

Cytological studies in cotton.—II, Two interspecific hybrids between Asiatic and New World cottons, A. Skovsted (*Jour. Genet., 28 (1934), No. 3, pp. 407–424, figs. 13*).—The second number in this series (E.S.R., 69, p. 638) reports a cytological examination of a slightly fertile hybrid between *Gossypium barbadense* × *G. arboreum* ($2n=39$), and of the sterile hybrid (*G. arboreum* × *G. herbaceum*) F_1 × [(*G. hirsutum* × *G. barbadense*) × *G. barbadense*] selfed ($2n=52$), for which the inference was that a diploid egg from Asiatic cotton had functioned. Study of somatic chromosomes of New World cotton showed that half of the chromosomes are small and the other half larger, being comparable in size to chromosomes of Asiatic cotton. The small chromosomes of New World cotton are of the same size as those in diploid wild species from North America. Species from the Old World and from Australia are all characterized by the larger size of their chromosomes. In the first meiotic division it was seen that at least 13 univalent chromosomes are present in both hybrids, and the hybrid with 52 chromosomes shows the same chromosome conjugation as in a triploid Asiatic cotton, but with the addition of an extra set of 13 nonhomologous chromosomes. New World cottons seem to be allopolyploid species, probably originated from a cross between two species of *Gossypium*, both with $n=13$ but possessing morphologically dissimilar and nonhomologous sets of chromosomes. The inference is that one parental species was an Asiatic cotton or a very closely allied type, while the other probably was a New World species.

A cytological study of the genus Sorghum Pers.—II, The meiotic chromosomes, C. L. Huskins and S. G. Smith (*Jour. Genet., 28 (1934), No. 3, pp. 387–395, figs. 27*).—Meiosis in pollen mother cells of some of the species considered in the previous contributions (E.S.R., 66, p. 725) is described from the same material.

In diploid sorghums ($2n=20$) 10 bivalents usually are found, but quadrivalents and sexivalents occur occasionally. In the tetraploid *S. halepense* ($2n=40$), quadrivalents, sexivalents, and octavalents sometimes occur. A fragmentally tetrasomic plant of *S. verticilliflorum* was found which was phenotypically normal. A strain of Dakota Amber sorgo was found to be partially asynaptic, yet multivalents occur in it with unusual frequency.

Inheritance of characters in sorghum—the great millet (*Indian Jour. Agr. Sci., 4 (1934), No. 1, pp. 81–99, pls. 3*).—Three more contributions are made to the series (E.S.R., 70, p. 461).

IV. *Brown grains*, G. N. R. Ayyangar, C. Vijiaraghavan, M. A. S. Ayyar, V. P. Rao, and P. Subramanyam.—In sorghum two factors, B_1 and B_2, appear responsible for production of a full brown color (not anthocyanic) on the grain, produced by their concurrent presence. Each of these factors can give a light brown wash to the grain provided *W*, determining the expression of pericarp color, also is present. In white-grained varieties B_1 and B_2 can be detected only through the color of the dry anther.

V. *Linkage between sheath—glume and dry anther—grain colours*, G. N. R. Ayyangar, M. A. S. Ayyar, and V. P. Rao.—A linkage, probably complete, was observed between *Qq* (for leafsheath and glume color) and *Bb* (for brown color in dry anther and grain).

VI. *Pearly and chalky grains*, G. N. R. Ayyangar, C. Vijiaraghavan, M. A. S. Ayyar, and V. P. Rao.—Sorghum grains may be grouped as pearly (translucent) and chalky (opaque), the latter being characterized by a large uneven deposit of starch in their thick mesocarp which gives a banded appearance to

the grain. Pearly (Z) behaved as a simple dominant to chalky (z). Colored grains also manifest this banded appearance when chalky.

Recent work on the genetics of millets in India, G. N. R. AYYANGAR (*Madras Agr. Jour., 22 (1934), No. 1, pp. 16–26*).—Recent genetic research in India and elsewhere, largely already noted, is reviewed for sorghum, pearl millet, ragi, Italian, Kodo, and barnyard millets, and proso.

Anomalous embryos of cultivated varieties of Prunus, with particular reference to fruit breeding, H. B. TUKEY (*Bot. Gaz., 95 (1934), No. 3, pp. 493–497, figs. 22*).—An examination at the New York State Experiment Station of 27 peach and 17 cherry varieties showed supernumerary cotyledons in the Early Purple, Burbank, Lyons, Coe, and Downer sweet cherries and in the Carman, Foster, Elberta, and Chili peaches. All but one of the embryos with extra cotyledons had three, the exception having four. The aberrant embryos germinated and developed sizable seedlings. In the opposite direction there was noted the suppression of one cotyledon in whole or in part, more common in the sweet cherry than in the peach. These and other irregularities observed in cultivated peaches and cherries lead the author to suggest that they might be used as an indication of the heterozygous nature of breeeding material in these two species.

Mode of inheritance of milk production and associated characters in cattle, J. W. GOWEN (*Maine Sta. Bul. 369 (1933), pp. 518–525*).—Based on the study previously noted (E.S.R., 70, p. 605), data are reported on the inheritance of milk and fat production.

A lethal dwarf mutation in the rabbit with stigmata of endocrine abnormality, H. S. N. GREENE, C. K. HU, and W. H. BROWN (*Science, 79 (1934), No. 2056, pp. 487, 488*).—A brief account is given of the occurrence of a dwarf mutation in the progeny of a Polish rabbit. The dwarf animals were born alive but none of them lived longer than a few days. Although delicately formed, they were fully developed in outward appearance except for the bones of the calvarium, which were generally incompletely calcified.

The dwarf character was lethal, and the homozygous animals weighed about one-third of the weight of the homozygous normals and one-half the weight of the heterozygous individuals. It is suggested that the abnormality is due to a primary pituitary disorder with the possibilities of secondary disturbances of other endocrine glands.

[Genetic studies with poultry by the Massachusetts Station] (*Massachusetts Sta. Bul. 305 (1934), pp. 55, 56*).—Brief results are given on the development of nonbroody and intense broody lines in continuation of results reported (E.S.R., 70, p. 666), continued studies of the inheritance of Rhode Island Red color in the F_2 and back-cross stock, studies on the genetic laws governing the results of inbreeding, studies of egg weight and shell character which have appeared in three domestic lines, and autosomal genetic factors for rate of feathering as contrasted to a sex-linked recessive factor for early feathering, all by F. A. Hays; and annual egg production, egg size, winter pause, and exhibition qualities in specially bred lines, by Hays and R. Sanborn.

Breeding for egg production, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Bul. 307 (1934), pp. 27, figs. 6*).—A description is given of the improvements which have been made by breeding in the station Rhode Island Red flock from 1916 to 1932, with special reference to such characters as rate of maturity, weight at first egg, winter pause, winter clutch size, percentage of broodiness and duration of broody periods, persistency, annual production, mortality, and hatchability.

Investigation on the sex life and transmission of domestic animals.—III, Has the boar an influence on the size of litters sired by him? [trans. title], H. F. KRALLINGER and A. SCHOTT (*Züchtungskunde, 9 (1934), No. 5, pp. 175–179*).—The average size of litters produced by the same sows mated to different boars is reported in 75 comparisons between individual sires. From these comparisons it is concluded that the boars have no influence on the size of litter.

The sexual cycle of the thirteen-lined ground squirrel in the laboratory, G. E. JOHNSON, M. A. FOSTER, and R. M. COCO (*Kans. Acad. Sci. Trans., 36 (1933), pp. 250–269, figs. 16*).—A study of the annual sexual cycle in large numbers of *Citellus tridecemlineatus arenicola* (Howell) at the Kansas Experiment Station showed it to be definitely seasonal. The period of enlargement and development of the genitalia occurred in nature immediately after the quiescence period which lasted from July to March, and practically all of the females were impregnated in April. However, for the animals kept in a warm animal house, general atrophy extended from about July to December. Although such males showed normal development, only about 60 percent of the females had open vaginas at any time and impregnation was rare.

The season of actual sexual development in the female is accompanied by enlargement of the vulva and ovaries, thickening and development of the walls of the uterus, and opening of the vagina; and in the male by the descent of the testes into the scrotum and by spermatogenesis.

The experimental development of the mammary gland, C. W. TURNER and E. T. GOMEZ (*Missouri Sta. Res. Bul. 206 (1934), pp. 44, figs. 24*).—The results of studies of the influence of crude extracts of oestrin and theelin recovered from the urine of pregnant dairy cattle and purified crystalline hormone theelin and theelol on the stimulation of the development of the duct system of the mammary gland of male mice and male and ovariectomized female guinea pigs are reported in the following papers:

I. *The male and female albino mouse.*—Growth of the duct system of the mammary gland was stimulated, but the growth of the lobules characteristic of pregnancy was not observed in the male mouse when 0.15 cc of corporin and 10 rat units of theelin were administered after a preliminary treatment with theelin. Castration appeared to have little influence on the type or rate of growth.

II. *The male and female guinea pig.*—Evidently species differences in the response of male and female guinea pigs to the oestrogenic hormone occurred, as theelin not only stimulated the growth of the duct system similarly to that observed in other species, but growth of the lobule-alveolar system was stimulated as well. Glands grown with 20 rat units of theelin injected daily for a period of 40 days were indistinguishable from those of animals pregnant for 33 days.

Injections of corporin with or without preliminary treatment with theelin were ineffective in stimulating growth beyond that produced by theelin alone.

Ovarian grafts stimulated rapid growth of the mammary system in experimentally cryptorchid guinea pigs, and they came into lactation when the remaining testis and graft were removed.

The lactogenic hormone initiated lactation in well-grown glands which had been stimulated immediately before with theelin. The lactogenic hormone, however, was found incapable of restimulating lactation after lactation ceased unless theelin was again administered.

The administration of galactin into pregnant animals invaribly resulted in death and abortion of the fetus.

FIELD CROPS

The value of covariance in analysing field experimental data, F. H. GARNER, J. GRANTHAM, and H. G. SANDERS (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 2, pp. 250–259*).—The covariance method of statistical analysis, here applied to results of a comparison of old and new seed of two bean varieties, seemed to be of considerable value in correcting for uncontrolled inequalities arising early in an experiment and in analyzing the effects of developmental factors on yield.

On the chi-square test for homogeneity, G. W. SNEDECOR and M. R. IRWIN (*Iowa State Col. Jour. Sci., 8* (*1933*), *No. 1, pp. 75–81*).—A test of technic is outlined for experiments with results expressed as probabilities for or against an event in groups of unequal frequencies. Applications of the test to enable an investigator to avoid erroneous conclusions if heterogeneity appears are given. For unequal frequencies, an efficient method of computing χ^2 and standard deviation is detailed.

[Agronomic research in Arkansas] (*Arkansas Sta. Bul. 297* (*1934*), *pp. 9–22, 41–46, 48–51, 52–57, 58, 59, 61–70, 99, 100, figs. 2*).—The more outstanding results obtained during more or less prolonged periods from 1887 to 1933 are reported from experiments with field crops (E.S.R., 68, p. 608) at the station and substations comprising variety trials with cotton, corn, wheat, winter and spring oats, rye, rice, grain sorghum, sorgo for sirup, potatoes, sweetpotatoes, soybeans and cowpeas for seed and hay, peanuts, and alfalfa; breeding work and natural crossing studies and selection with cotton for oil and protein content; fertilizer trials with cotton, alfalfa, potatoes, sweetpotatoes, and rice; study of the fertilizing effects of legumes on spring oats; cultural (including planting) tests with cotton, corn, oats, wheat, rye, rice, soybeans, cowpeas, alfalfa, and sweetpotatoes; effect of corn cultivation on the nitrate and moisture content and efficiency of cover crops on nitrogen conservation in the soil; interplanting of cowpeas, soybeans, and other legumes in corn; breaking of dormancy with potatoes; control of rice weeds; a study of the comparative grade and staple length of Arkansas commercial cotton; cotton fiber investigations concerned with the effects of hybridization, season, soil type, and of different rates and formulas of fertilizers; and pasture studies dealing with establishment, plants, grazing capacity, and fertilization. Cotton fertilizer studies have taken up formulas for different sections, rates of application, placement, home v. factory mixed, nitrogen carriers, and the effects of nitrogen, phosphorus, and potassium on the fruiting of cotton.

[Farm crops experiments in Iowa], A. L. BAKKE, W. E. LOOMIS, J. M. AIKMAN, F. G. BELL, F. S. WILKINS, H. D. HUGHES, P. E. BROWN, F. B. SMITH, L. C. BURNETT, J. B. WENTZ, C. Y. CANNON, M. T. JENKINS, A. A. BRYAN, J. L. ROBINSON, E. R. HENSON, W. G. GAESSLER, E. V. COLLINS, C. S. REDDY, H. GIESE, S. M. DIETZ, H. C. MURPHY, E. W. LINDSTROM, and A. T. ERWIN (*Iowa Sta. Rpt. 1933, pp. 53, 54, 57, 58, 77–94, 112, 133, 135, 136, figs. 3*).—The progress (E.S.R., 69, p. 37) is reviewed briefly for breeding work with oats, barley, wheat, reed canary grass, soybeans, and potatoes; variety tests with oats, wheat, barley, alfalfa, red clover (strains), sweetclover, soybeans, potatoes, and sorgo; trials of legumes and grasses for hay and pasture; variety-cultural experiments with oats, wheat, and barley; cultural studies with reed canary grass, sugar beets, potatoes, and with alfalfa on bacterial wilt infected soil; the merits of Phalaris grass on different soils; the effect on alfalfa of spring-burning natural mulch material; the relation of moisture to respiration in stored oats; factors involved in the curing and storage of hay; factors influencing the hard seed in legumes and the value of such seed when

planted in the field; technic for determining water content of green forage; trials of nurse crops for small-seeded legumes; trials of legumes for green manure; storage and fertilizer tests with sweetpotatoes; studies of the annual spread of and control methods for creeping Jennie and leafy spurge; and eradication of biennial sweetclover by cultivation.

The extensive corn investigations considered genetic interrelations and prepotencies of inbred lines; the relation of time of planting to yield and quality of produce among crosses between inbred lines; comparison of inbred lines obtained from open-pollinated varieties and from crosses between inbred lines; improvement through the use of inbred lines; the relation between the development and seed value of the corn kernel; ear and kernel characteristics of seed corn in relation to yield; growth response of corn hybrids and varieties on soils of different levels of fertility and on various soil types; the measurement of limiting environmental factors in the growth of the plant at different rates and spacings; correlation between composition and stiffness of stalk; rate, date, and method of planting varieties differing in maturity; trials of planting methods; a study of varieties and strains in different parts of Iowa; storage studies; maintenance of pure seed sources of improved crop varieties through field inspection and certification; and the production and distribution of seed of corn hybrids and of the parents from which they are derived. Certain phases of the research were in cooperation with the U.S. Department of Agriculture.

Experiments with forage crops at the Fort Hays Branch Station, Hays, Kans., 1913 to 1928, R. E. Getty (*U.S. Dept. Agr., Tech. Bul. 410 (1934), pp. 92, figs. 27*).—Experiments in the production of cultivated forage crops, conducted on upland soil under dry-farming conditions representative of an extensive area in the central Great Plains in cooperation with the Kansas Experiment Station, are reported on for the period 1913–28. Information is also included on the agriculture of the region, soils, climatic conditions, insects, rodents, birds, and diseases attacking crops, and on experimental methods. See also an earlier account (E.S.R., 45, p. 32).

Promising sorghum varieties included Early Sumac, Atlas, Dawn and Pink kafir, and feterita. Red Amber showed susceptibility to head smut, and Kansas Orange is being replaced by Atlas. Modoc (Pink kafir×Freed) was promising as a dual purpose crop for the northwestern border of the sorghum belt. The merits of other sorts are indicated briefly. The progress of improvement of the various sorghums by introduction, selection, and by crossing is reported in some detail.

Variety-planting tests indicated that sorghums could be seeded satisfactorily over a wide range period, especially for forage, but that for practical purposes seeding should usually be completed within the period May 15 to June 15. For grain, the standard sorts should usually be seeded May 15 to 31, but early sorts as feterita and Freed often give the best results from June 15 seeding. Forage yields of Red Amber and feterita increased regularly with the thickness of stands. Pink kafir in regular 40-in. rows produced about 10 percent more forage than in alternate 40- and 80-in. rows, and 20 percent more than 80-in. rows, but in all cases both forage and seed yields were in direct ratio with the closeness of spacing within the row. Red Amber sorgo tonnage differed little with seeding rates from 15 to 75 lb. per acre, although 30 and 45 lb. were most desirable when quality of hay was considered. The medium early sorgos, Early Sumac, Red Amber, and Leoti Red, appeared best suited for close-drilled hay production under normal conditions. In variety tests in close drills for grain production (8- to 16-in. v. 40-in. rows), 40-in. rows were definitely superior, and a suitable variety for the purpose seemed to be needed.

Seeding tests with Sudan grass for hay suggested that nothing was to be gained by seeding before May 15, but that the grass should be planted as soon thereafter as warm weather and a good seed bed were available. The 24-in. rows with a 7-lb. rate outyielded 20 lb. in close drills or 40-in. cultivated rows. Legumes seemed unable to survive in mixture with close-drilled Sudan grass under dry-land condition regardless of the seeding ratio. Cutting for hay at different maturity stages, 1915–19, led to the conclusions that Sudan grass should usually be cut for hay at the first-head to the full-head stage, although earlier cutting may be justified when the crop is being checked in growth or when high-protein hay is sought rather than maximum tonnage and food nutrients. The crop may be cut satisfactorily over a wide range of time, even to the seed stage, but it becomes woody after the seed begins to form. Sudan grass produced better tonnage after alfalfa on bottom land than after winter wheat on upland. In comparison for hay, sorgo produced more tonnage than Sudan grass which had other advantages. Both were superior to millet. Seed yields averaged 202 lb. in 24-in. rows, 217 in 40-in., and 195 lb. in 80-in. rows, these yields appearing unprofitable at current prices. The behavior of sorgo-Sudan grass hybrids, Tunis grass (*Sorghum virgatum*), perennial Sudan, Black Sudan (*S. versicolor*), and Tabucki grass (*S. verticilliflorum*) is also described briefly.

Kursk, Siberian, Hungarian, and Goldmine did well among the millet varieties, but the crop is declining in importance. Most of the 50 annual and perennial grasses grown usually in nursery rows were definitely unsuited for dry-land conditions. Bromegrass tested extensively usually made good normal growth 2 to 3 ft. tall in cultivated rows or hills, but did poorly in close-drilled seedings on dry land. *Agropyron repens* and *Calamagrostis epigejos*, aggressive and rapidly spreading grasses, offered promise for pasture. The possibility of reestablishing buffalo grass sod alone or in combination with sweetclover was under study.

Practically all of the successful seedings of alfalfa recorded on the branch station from 1902 to 1928 were made within the period April 15 to May 15, but about once in 3 yr. good stands may be had from August seedings, preferably early in the month and shortly after a good rain. Results as to stands and yields obtained from seeding on upland, 1906–28, are noted. Data on hay production for 1914–27 showed very little difference in yields among 6-, 12-, 24-, 30-, 36-, and 42-in. row widths for any one year or in the 14-year averages, yield depending on total moisture available, irrespective of distribution of the plants within the limits tested. In this section the close-drilled method seemed preferable on account of quality of hay and economy in management. Allowing the alfalfa crop to stand beyond the hay stage appeared neither to have injured nor stimulated the vitality of the plants at any time. Cultivation of close-drilled or broadcast stands of alfalfa was not profitable. In variety tests and nursery experiments, Kansas common was as desirable as any and superior to most alfalfas for conditions at Hays.

Success with sweetclover (*Melilotus alba*) required suitable weather conditions and a firm seed bed. Cultural methods, as studied in planting and companion crop tests, usually had less influence on growth of sweetclover than did the weather. In good seasons nearly all methods succeeded, while in poor seasons all but the best methods failed. The most practical method, all things considered, was to plant late with a thin seeding of barley on land previously in sorghum. The best time to cut for hay in the first year was apparently when the growth reached 24 to 30 in. and before the leaves began to fall. The plants generally survived cutting for hay or clipping for weed control at almost

any stage during the first year, provided plenty of soil moisture was present. Hay yields from the second year's growth were variable, and survival after the first cutting was very uncertain. There seemed to be no need of leaving a high stubble if the hay crop is taken off at the proper time, i.e., when plants are 24 to 30 in. tall. A limited grazing test with milk cows on second-year sweetclover is noted. The possible values of different strains of *M. alba, M. officinalis*, and *M. indica* are described from nursery trials.

Low yields obtained in varietal and cultural experiments with field peas, cowpeas, soybeans, tepary beans, and pinto beans indicated that relatively little profit would be expected from growing these crops, nor did hairy vetch, chickpeas, mung beans, navy beans, Korean lespedeza, kudzu, sainfoin, tedera (*Psoralea bituminosa*), sunflowers, rape, or kale appear suitable for the region. Sugar beets and mangels thrived under irrigation but are not suited to general dry-farming conditions.

[Field crops work in Louisiana] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 13–15, 19, 20, 27–29*).—Outstanding results are cited briefly from continued recent experiments (E.S.R., 67, p. 233) including variety tests with cotton, sugarcane, and potatoes; breeding work with cotton, sugarcane, oats, and potatoes; fertilizer trials with cotton, sugarcane, potatoes, and sweetpotatoes; rotations for sugarcane; and miscellaneous experiments with forage and cereal crops.

[Field crops experiments in Maine] (*Maine Sta. Bul. 369 (1933), pp. 529–535, figs. 3*).—Progress is described briefly from experiments at Aroostook Farm by J. A. Chucka and D. B. Lovejoy, including comparisons of fertilizer formulas, carriers of phosphorus and of potash, " uncommon " elements and green manures, a fertilizer placement study in cooperation with the U.S. Department of Agriculture, and effects of magnesium in fertilizers, all with potatoes; and variety tests with oats, barley, spring and winter wheat, rye, and flax for seed.

[Agronomic experiments in Massachusetts], A. B. Beaumont, M. C. Darnell, R. W. Donaldson, M. E. Snell, L. S. Dickinson, W. H. Sawyer, E. B. Holland, and E. Bennett (*Massachusetts Sta. Bul. 305 (1934), pp. 7–9, 10, 14, 23, 48*).—Research with field crops again reviewed briefly (E.S.R., 69, p. 643) comprised variety trials with alfalfa, red clover, lespedeza, vetch, and soybeans; studies of the effects of chemical weed killers on cranberry weeds, cranberry vines, and poison ivy; and forage crops experiments including pasture studies, top-dressing meadows with different complete fertilizers and different nitrogen carriers, planting tests with crimson clover, longevity of alfalfa stands, comparison of hulled v. unhulled sweetclover seed, fertilizer tests, and comparisons of peats and leaf molds on fine turf grasses. Experimentation with tobacco dealt with cropping systems, nitrogen carriers, proportion of organic: inorganic nitrogen in the fertilizer, methods of applying fertilizers, and the effects of fertilizer and cultural treatment on the composition of Havana tobacco.

Report from Holly Springs Branch Experiment Station for 1933, C. T. Ames (*Mississippi Sta. Bul. 302 (1933), pp. 8*).—Experiments reported on for 1933 and earlier years and supplementing previous work (E.S.R., 67, p. 28) included comparisons of varieties on valley and hill land, spacing tests, comparisons of fertilizer analyses and rates of application, trials of phosphorus carriers, and lint yields on limed v. unlimed land following 3 yr. of soybeans, all with cotton; and a variety test with corn.

[Agronomic studies in New Hampshire] (*New Hampshire Sta. Bul. 280 (1934), pp. 8–11, 20, 21*).—Experiments with field crops reviewed briefly in-

cluded the growing of hay on neglected hay land and alfalfa on worn-out soil, by F. S. Prince and T. G. Phillips; top-dressing grass-hay lands with nitrogen carriers; effect of time-of-cutting on yield and feed value of hay; top-dressing old pastures with nitrogen carriers and complete fertilizers, by Prince, Phillips, P. T. Blood, and G. P. Percival; fertilizer tests with red clover, sweetclover, and alfalfa in the Connecticut Valley, and with soybeans on the Ireland Farm; variety tests with soybeans, lespedeza, white clover, barley, oats, and oats-legume combinations, by Prince and Blood; fertilized dairy and potato rotations; comparison of drilling v. broadcasting fertilizers and spraying v. dusting, both for potatoes; a study of the influence of growing potatoes, cabbage, and other plants at reduced temperatures on their relative hardiness to freezing, by S. Dunn; and trials of sodium chlorate and ammonium thiocyanate as herbicides and the persistence of their toxicity in the soil.

Establishment, maintenance, and improvement of pastures, H. N. Vinall and C. R. Enlow (*U.S. Dept. Agr., Misc. Pub. 194 (1934), pp. 2–43, figs. 10*).—This section of the pasture handbook (see p. 575) discusses factors to be considered in establishing pastures, indicates the several kinds of tame and natural pastures, describes the adaptation and cultural needs of desirable grasses and legumes and includes mixtures for different sections of the United States, and provides information on the cultural, seeding, fertilization, grazing, weed and pest control, burning, and drainage practices variously involved in establishing, maintaining, and improving permanent pastures. The merits of certain crops in supplementing permanent pasture in seasons when it is unproductive are pointed out, with remarks on the use of these crops in succession for annual pasture in certain sections, pasturing aftermath of meadows, and on the longevity of seeds of pasture plants.

[Pasture studies in the Union of South Africa] (*So. African Jour. Sci., 30 (1933), pp. 288–323, figs. 5*).—The three papers in this group include Pasture Investigations in Southern Rhodesia, by the Marquis of Graham and T. D. Hall (pp. 288–306); Notes on the Study of Plant Succession in Relation to Grazing, by J. W. Rowland (pp. 307–316); and The Botanical Survey of Intensively Grazed Veld, by D. Moses and Z. Deenik (pp. 317–323).

Resumé of 12 years pasture experimental work at Kybybolite, L. J. Cook (*Jour. Dept. Agr. So. Aust., 37 (1933), No. 3, pp. 248–260, figs. 4*).—Pasture studies from 1921 to 1932 on the Government Experimental Farm comprised trials of grasses and mixtures, fertilizer tests on native and cultivated pasture, and management practices. Features of the work were the response of both native and cultivated pastures to phosphatic fertilizer and the greater wool production on cultivated and on fertilized natural pasture than on unimproved land.

Irrigated pasture investigations: Experimental technique, E. T. Beruldsen and A. Morgan (*Jour. Dept. Agr. Victoria, 31 (1933), No. 5, pp. 251–257, 260, figs. 3*).—Technic employed in yield and grazing trials, botanical surveys, chemical analyses, and irrigation and fertilizer experiments in irrigated pasture research at the Werribee State Research Farm is outlined.

Irrigated pastures: Results of manurial trials, L. C. Bartels, E. T. Beruldsen, and A. Morgan (*Jour. Dept. Agr. Victoria, 31 (1933), No. 2, pp. 86–100, figs. 6*).—Fertilizer studies at Werribee State Research Farm with a pasture sown to a grass and clover mixture and receiving irrigations when needed dealt with yield and its seasonal distribution and the botanical and chemical composition of the forage. As indicated by yields of dry matter, superphosphate gave significant increases from 0 to 4 cwt. per acre, while neither nitrogen carriers nor potash alone or with superphosphate showed

promise, and the same trend was evident in seasonal production. Superphosphate produced better results than rock phosphate or basic slag. Phosphatic fertilizers increased the production of the major species, ryegrass, orchard grass, white clover, and subterranean clover, while the nitrogen and potash seemed to favor these grasses and depress the two clovers. Phosphorus, especially as superphosphate, increased the protein content and feeding value and the mineral content of the herbage, and nitrogen depressed them, while potash had no appreciable effect.

Pasture establishment on pumice lands, P. W. SMALLFIELD (*New Zeal. Jour. Agr., 47 (1933), No. 6, pp. 337–359, figs. 19*).—Grasses, mixtures, and practices, based on experiments and experience, are indicated for pasture establishment on sandy soils derived from pumice stone, with data on farm establishment and pasture production costs.

The influence of precipitation and grazing upon black grama grass range, E. W. NELSON (*U.S. Dept. Agr., Tech. Bul. 409 (1934), pp. 32, pls. 2, figs 5*).—The growth and associations of black grama (*Bouteloua eriopoda*) on the southwestern ranges, its response to the limiting factor, precipitation, the relation of precipitation to vegetation, and the reaction of the grass to different intensities of grazing are described from a 13-year study on the Jornada Experimental Range in southern New Mexico. The period of study, 1915–27, included two droughts, one of which continued through 1916, 1917, and 1918, and a second which began in the late summer of 1921 and continued almost 5 yr. until the spring of 1926.

The grass owes its great value in this region of low, uneven rainfall, high temperatures, high evaporation, and relatively severe winds, to its characteristic drought resistance and its high palatability and forage value both in summer and in winter. Its main growth is made during the summer rainy season, ordinarily July, August, and September, while only under the most favorable precipitation is there spring growth. The grass seldom reproduces from seed but, after drought or overgrazing, revegetates rapidly from residual plants by tillering and by stolons. The increase or decrease in the area of black grama from one fall to the next seemed to be influenced mainly by the vigor of plants at the start of the current growing season, as reflected by the previous year's or even by the previous summer's precipitation. Current summer-seasonal rainfall had no significant effect on the current change in plant density. Although ordinarily one favorable growing season appeared necessary to restore the vigor of weakened plants before marked improvement in the stand began, the rainfall during the current summer season largely determined the height growth during that season on existing stands.

The test results emphasized the ability of black grama to survive drought and to recover after a drought period, to compete successfully with associated species, and to remain as the dominant plant on conservatively grazed range in spite of encroachment of sand dropseed and 3-awn grasses and other species after depletion of stand by drought. Its ability to withstand conservative utilization by livestock, without a reduction in stand except the variations due to vicissitudes of climate, suggested conservative grazing as the most stable and productive system of grazing. Heavier grazing use, in the degree of its intensity, was observed to result in gradual or extreme deterioration, a subordinate stand of black grama, reduced grazing capacity, and unsatisfactory conditions for permanent livestock production.

Reseeding burned-over lands in northern Idaho, J. H. CHRIST (*Idaho Sta. Bul. 201 (1934), pp. 28, figs. 9*).—Plantings of varieties of the more important forage grasses and clovers made under various conditions during several

years on burned-over forest lands and also in rows at the Sandpoint Substation furnished information on practices and on the merits of available forages and possible combinations for reseeding purposes.

Burned forest land can be seeded during the autumn of the fire, on the snow, on honeycombed land, or in early spring, but seedings later than the year after burning were not successful. Fall seedings permit grazing the following year. It is pointed out that livestock should be kept from spring seedings until late summer. Tillage seemed unnecessary for a coverage of the small seeded grasses and legumes, since the beating of rain and the action of frost furnish enough coverage to assure germination and survival. Heavy seedings seemed to prevent rapid encroachment of weeds and browse, light seedings being destroyed more easily by overgrazing which permits the growth of less desirable plants.

The seed for burned-over lands should include a legume to maintain yields and enhance the palatability of the forage. Such large seeded grasses as smooth bromegrass, tall oatgrass, and the wheatgrasses were not established readily under the experimental conditions. Livestock preferred forages like timothy, orchard grass, meadow fescue, tall meadow oatgrass, and bromegrass to such species as redtop, Kentucky bluegrass, and the wheatgrasses. While all the common clovers are suitable for reseeding purposes, only sweetclover maintained the original cover, and it always was improved as the stand grew older.

The effect of sodium nitrate on the growth and nitrogen content of a lucerne and grass mixture, H. G. THORNTON and H. NICOL (*Jour. Agr. Sci. [England], 24 (1934), No. 2, pp. 269–282, figs. 12*).—When inoculated alfalfa was grown alone at the Rothamsted Experimental Station in pots of sand watered with nutrient solution plus 0.33, 1, and 3 g of sodium nitrate per pot, the dose of nitrate did not affect its dry weight or nitrogen content except that the highest dose checked root growth somewhat. When alfalfa and Italian ryegrass were grown in association, the growth of the grass varied directly with the dose of nitrate applied, and the growth of the alfalfa varied inversely to it. The checking of the alfalfa growth probably was due to root competition with the grass. The nitrogen contents of the combined alfalfa and grass tops and that of the combined roots were also related inversely to the quantity of nitrate applied. There was evidence that, within 3 mo. of sowing, the grass had obtained nitrogen fixed by the nodules on the alfalfa.

The effect of nitrogenous fertilizers on the growth of lawn grasses, J. W. ZAHNLEY and F. L. DULEY (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 231–234, fig. 1*).—When applied to Kentucky bluegrass, Washington bentgrass, and German mixed bentgrass, ammonium sulfate, sodium nitrate, and urea were about equally effective when supplying equivalent amounts of nitrogen, although there was a slight advantage for urea with each grass. Ammonium sulfate with compost gave a slight increase over urea, probably due to additional plant food supplied in the compost. As much as 1,633 lb. of ammonium sulfate or 2,156 lb. per acre of sodium nitrate supplied in six applications during the season were used without injury to the grasses. The number of dandelions was reduced greatly by heavy applications of ammonium sulfate, attributed to increased competition by the grass due to greater growth in response to fertilizer. The pH value of the Wabash silt loam soil was not affected greatly even by the heavy fertilizer treatments, although ammonium sulfate tended to make the soil slightly acid.

Fertilization of fairways: Some experimental results, K. WELTON (*Bul. U.S. Golf Assoc. Green Sect., 13 (1933), No. 6, pp. 183–199, figs. 3*).—The effects of a 6–12–4 organic and a 6–12–4 inorganic fertilizer applied to a thin

turf of Kentucky bluegrass on a fairway at Glen Echo, Md., in October 1931, October 1932, and March 1933 were compared.

Heavy applications of fertilizers built up a thin turf of Kentucky bluegrass during fall and spring to a thick dense turf free from clover and certain perennial weeds. Some burning, from which the bluegrass soon recovered, was observed where 1,400 lb. per acre of inorganic fertilizer was used in a single application, while organic fertilizers did not burn the grass. Soil acidity was increased by the inorganic fertilizer, probably due to its content of ammonium sulfate, but not by organic fertilizers. The available phosphoric acid in the surface inch of fertilized plats increased decidedly, although only a small increase occurred below the 2-in. level. The phosphoric acid from inorganic fertilizer penetrated to the second, third, and fourth inches more readily than that from the organic fertilizer. The organic-matter content of the soil was greatly increased by the heavy fertilization, inorganic and organic fertilizers proving equally effective.

Culture of cereals in Spain, D. Nagore (*Cultivo de los cereales en España. Madrid: M. Marín and G. Campo, 1933, pp. 222, figs. 90*).—This practical manual describes the principal types and varieties of spring and winter grains grown in Spain and improved cultural and field practices and harvesting and storage methods, and discusses briefly diseases and their control, improvement of the crops, and development of the industry in Spain.

Some factors influencing lodging in cereals, J. Brady (*Jour. Agr. Sci. [England], 24 (1934), No. 2, pp. 209–232*).—Analyses of variance for all morphological characters associated with strength of straw, i.e., tillering, length of straw, lengths of internodes, diameter of fifth internode, thickness of culm wall, number of vascular bundles, width of lignified tissue in a cross section, and thickness of sclerenchyma cell walls on Glasnevin Sonas oats (highly resistant to lodging), Victory II (intermediate), and Sandy (easily lodged) grown in a Latin square at Albert Agricultural College, Glasnevin, Ireland, showed that Glasnevin Sonas possessed characters associated with strength of straw to a significantly greater degree than the other varieties. However, all these characters proved so subject to the effects of soil variation that their use for the isolation of lodging-resistant strains could be utilized only on a relative basis.

Cultural practices for alfalfa in northern Idaho, H. W. Hulbert and F. L. Burkart (*Idaho Sta. Circ. 72 (1934), pp. 8*).—Production practices suggested from the results of station experiments included the choice of a hardy variety or strain (E.S.R., 71, p. 37), drilling or broadcasting inoculated seed early—Grimm at 8 lb. and common alfalfa at 11 lb. per acre—on a firm, moist, weed-free seed bed and without a nurse crop, firming the seed bed with a roller after planting, and cultivating only to control weeds and grass. Gypsum should be applied at the rate of 200 lb. per acre every 3 yr. in the cut-over areas (E.S.R., 63, p. 334).

Honey bees in relation to lucerne seed setting, R. E. P. Dwyer and S. L. Allman (*Agr. Gaz. N.S. Wales, 44 (1933), No. 5, pp. 363–371*).—Individual honeybees were observed to trip up to 64.7 percent of the alfalfa flowers visited in continued seed setting studies (E.S.R., 67, p. 237). In a caging experiment, seed from the cage containing honeybees was of better quality and more abundant than that obtained under natural conditions, while practically none was formed in the cage without bees. The experience of successful seed growers and experiments of others are discussed with reference to such activities of honeybees.

Effects of shade on the growth of velvet bent and Metropolitan creeping bent, M. E. Reid (*Bul. U.S. Golf Assoc. Green Sect., 13 (1933), No. 5, pp. 131–135, fig. 1*).—Experiments wherein the two grasses grown in pots were subjected to full sunlight and several degrees of shade furnished evidence that shade, if not too intense, may benefit the top growth of velvet bent in a soil of low fertility, although root growth may be restricted about in proportion to the degree of exclusion of light. No beneficial results of shading Metropolitan creeping bent were observed under the conditions.

Buffalo grass for fairways in the Plains States, D. A. Savage (*Bul. U.S. Golf. Assoc. Green Sect., 13 (1933), No. 5, pp. 144–149, fig. 1*).—Propagation methods, based on research at the Ft. Hays (Kans.) Substation in cooperation with the U.S. Department of Agriculture, are recommended for golf courses in the Plains States interested in establishing native buffalo grass on fairways.

Maturity of seed corn in relation to yielding ability and disease infection, B. Koehler, G. H. Dungan, and W. L. Burlison (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 262–274, figs. 3*).—As indicated by the laboratory germinations, seedling vigor, field stands, yields and resistance to seedling diseases, and ear rots of seed of Reid Yellow Dent corn, selected and harvested during 7 yr. at the Illinois Experiment Station in stages of maturity ranging from about 20 days after fertilization until 6 weeks after maturity, mature seed proved of greatest value for best results. While in case of emergency seed can be picked as early as 20 days after fertilization with fair assurance that it will reproduce itself, careful handling is essential. The progress of these and related studies have been noted earlier.

Reports [on cotton investigations] received from experiment stations, 1931–1932 [and] 1932–1933 (*London: Empire Cotton Growing Corp., 1933, pp. IX+173, pl. 1, figs. 44; 1934, pp. XI+234, figs. 26*).—The further progress of research with cotton (E.S.R., 67, p. 33), rotation crops, and control of cotton insects and diseases, conducted under the auspices of or by officials connected with the Empire Cotton Growing Corporation, is reported on from the same localities and Magut, Union of South Africa.

Effect of fertilizers on the yield of cotton and on the control of the root-rot disease of cotton on the Blackland Prairie soils of Texas, E. B. Reynolds and H. E. Rea (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 313–318*).—Numerous fertilizer experiments with cotton, conducted in cooperation with farmers on soils in the Blackland Prairie in 1930–32 by the Texas Experiment Station, showed that 4–8–4, 4–8–0, and 6–12–0 fertilizers produced significant but not profitable increases in yield of cotton. The fertilizer treatments had no effect on the root rot disease (*Phymatotrichum omnivorum*).

Identification of sex in ganja (Cannabis indica Lamk) by botanical characters, P. Satyanarayana (*Madras Agr. Jour., 22 (1934), No. 1, pp. 3–6, figs. 4*).—In very early stages the male flowers are short, ovoid or round, and appear in clusters, whereas the females are linear or spear-shaped and occur in spikes, except the individual female flowers seen in the leaf axils on the main stem. Where no trace of flower is seen, the presence of small vegetative buds in the axils of leaves on the main stem is almost a sure indication of a male plant.

Kale as a substitute for swedes, turnips, and mangolds, H. G. Miller (*Scot. Jour. Agr., 16 (1933), No. 4, pp. 456–466*).—Compared to root crops, kale is described as having a higher feeding value per unit weight, efficiently converting nitrogenous fertilizer into protein and being low in labor requirements, although it suffers from bird and vermin damage, loses weight and value in the spring, and there may be waste in grazing. In discussing research at

Rothamsted and elsewhere in Great Britain, the author indicates the need for further investigation on kale and the root crops.

Natural crossing in Setaria italica (Beauv.), N. TAKAHASHI and T. HOSHINO (*Crop Sci. Soc. Japan Proc., 6 (1934), No. 1, pp. 3–19; Japan. abs., pp. 18, 19*).—Frequent natural crossing in Italian millet was noted at the Western Chosen (Shariin) Experiment Station, an average of 0.59 percent occurring among 3,295 varieties or strains from Japan, Chosen (Korea), Manchuria, and North China. Varieties shooting from July 15 to 31 had higher percentages than earlier or later sorts. Thickly bristled heads showed lower percentages than rough bristled millets. The influence of proximity and of direction of the wind were quite evident. F_2 and F_3 studies of hybrid colored plants appearing in noncolored strains in these tests revealed segregation in 3:1 and 9:7 ratios.

Farm practice with lespedeza, H. A. MILLER (*U.S. Dept. Agr., Farmers' Bul. 1724 (1934), pp. II+18, figs. 4*).—Varieties, cultural and fertility practices, the uses of the crop for hay, pasture, and orchard cover, and the place of lespedeza in the cropping system are described on the basis of information collected from farmers in Virginia, North Carolina, Tennessee, and Kentucky growing lespedeza regularly as a farm crop.

The agricultural features of Phalaris tuberosa and allied forms, H. C. TRUMBLE (*Jour. Dept. Agr. So. Aust., 37 (1933), No. 4, pp. 400–425, figs. 8*).—The relationships and agricultural history of species of *Phalaris*, the role of *P. tuberosa* in pastures in Southern Australia, its agronomic characteristics, drought resistance, and productivity, and some agricultural features of *P. canariensis*, *P. minor*, and *P. coerulescens* are discussed, largely from studies at the Waite Agricultural Research Institute.

Potato-manuring experiments: Investigations into the effect of width of plots on yield determination, A. W. HUDSON and E. M. BATES (*New Zeal. Jour. Agr., 48 (1934), No. 2, pp. 90–96, fig. 1*).—Fertilizer experiments were made with potatoes in which no fertilizer (O), 3 cwt. superphosphate (P) per acre, P plus 1 cwt. ammonium sulfate (PN), PN plus 1 cwt. potassium sulfate (PNK), and P plus 1 cwt. potassium sulfate (PK) treatments were replicated from 10 to 20 times in three 30-in. row-plats, each 2 chains long in 1929–30 and 1 chain long in 1930–31 and 1931–32. The fine sandy loam soil responded to superphosphate and ammonium sulfate but not so much to potassium sulfate. All rows were harvested separately.

The side rows of unfertilized plats alongside rows receiving P or PK did not differ significantly from the middle row or derive benefit from fertilizer on the adjoining rows. Side rows of P plats next to O significantly outyielded their middle rows, while side rows of P plats next to PN did not differ significantly from their middle rows. Estimating yields from P treatment situated next to O from all rows in 3-row plats resulted in an overestimation of the effect of the phosphate. Single-row plats would result in a greater overestimate. The side rows of PN plats alongside P on one side and PNK on the other, and side rows of PNK plats alongside PN on one side and PK on the other, usually did not differ appreciably from their middle rows. The side rows of PK plats next to O differed from the middle row in one experiment, but not appreciably in the other two. Side rows of PK plats next to PNK did not differ appreciably from their middle rows. Because the treatments receiving nitrogen were about as superior in top growth to P and PK as P and PK were to O, rows of P next to O possibly were at an advantage compared with other rows of this treatment, primarily because of less root competition. The failure of side rows of PK next to O, which were

very similar in appearance to corresponding rows of P, to conform in all seasons to the behavior of P is discussed.

Indications were that single-row plats for comparison of treatments, all receiving a basal dressing of phosphate, should be reasonably satisfactory, but that where phosphate is being compared with no fertilizer on a soil responsive to phosphate, plats should contain at least three rows and the outside rows should be disregarded in yield determinations. The effect of potash was slight in these trials, and on a soil more responsive to this fertilizer the behavior of side rows relative to middle ones may have been different.

On the experiments of germination and absorption power of water in the seeds of rice as a method of estimation of drought resistance among the varieties of rice plants [trans. title], J. Onodera (*Crop Sci. Soc. Japan Proc., 6 (1934), No. 1, pp. 20–43; Eng. abs., pp. 41–43*).—These methods were not found satisfactory for determining drought resistance of several rice varieties.

Studies on paddy cultivation (*Trop. Agr. [Ceylon], 81 (1933), No. 1, pp. 3–35, pls. 3*).—The first papers in this series deal with the fertilization of rice.

I. *The paddy crop in relation to manurial treatment—a general discussion*, J. C. Haigh and A. W. R. Joachim (pp. 3–10).—The relative effects of superphosphate and green manure, alone and in combination, and ammonium phosphate v. no treatment on rice were studied on medium loam soil at the Peradeniya Experiment Station during the Maha 1931 and Yala 1932 crop seasons (October 1931 to September 1932). Phosphorus appeared to be the limiting factor determining crop yield on Ceylon rice soils, confirming earlier results, and available nitrogen as replaceable ammonia, the second factor. The higher average yield during Maha seemed due to a combination of the longer period of growth (6.5 v. 4.5 mo.), the higher replaceable ammonia content, and the greater available phosphoric acid content of the soil, and also the influence of variety (Mawi for the Maha and Heenati for the Yala crop). Data also are given on the composition of the crop, uptake of nutrients, and on losses in soil nitrogen, carbon, and exchangeable bases, and on changes in pH values in the soil.

II. *The effect of manures on the composition of the paddy crop and soil*, A. W. R. Joachim, S. Kandiah, and D. G. Pandittesekere (pp. 11–35).—This paper details and discusses the analytical data relative to the foregoing investigation.

Studies of irrigation methods for sugar beets in northern Colorado, H. E. Brewbaker (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 222–231, fig. 1*).—Further studies of methods of irrigating sugar beets (E.S.R., 70, p. 770) were made in 1932. The yield data, indicated sucrose production, and characteristics of beets, obtained in 1931 and 1932 under conditions of unusually deficient rainfall, suggested that a desirable irrigation practice with sugar beets would consist of early initial spring application followed by rather frequent light applications and a relatively late application in the fall.

Cane seedling production in Florida, B. A. Bourne (*Facts About Sugar, 29 (1934), No. 2, pp. 63, 69*).—The scope of breeding work carried on by the Florida Experiment Station with sugarcane is summarized with special reference to number of seedlings, kinds of combinations successful, and genealogical history of the various selections.

Results of test to determine the effect of stubble shaving on yields of cane and sugar, G. Arceneaux (*Sugar Bul., 12 (1934), No. 8, pp. 4–6*).—The effects of shaving the stubble of P.O.J. 36–M, Co. 281, and C.P. 807 sugarcane varied somewhat with the varieties in tests conducted near Houma, La., by the U.S. Department of Agriculture in 1930–32, but according to 3-year averages

resulted in reduced acre yields of cane and sugar in all varieties. Shaving during March resulted in greater average reductions in cane and sugar per acre than shaving in January or February. Indications were that, while stubble shaving may be beneficial with certain varieties under certain conditions, the practice must be regarded primarily as a labor-saving expedient generally performed at a sacrifice in yields of cane and sugar.

Self-incompatibility in yellow sweet clover, Melilotus officinalis, R. A. Brink (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 307–312*).—The immediate cause of the self-incompatibility observed in common yellow sweetclover, according to Wisconsin Experiment Station studies, is a reduced rate of germination of the pollen of a plant on its own stigma, failure of many of the tubes formed to become established in the style, and the slow growth of those penetrating the pistil. After cross-pollination pollen grains germinate freely, and many tubes are found at the base of the style after 24 hr. Individual yellow sweetclover plants appear to vary significantly in their norms for self-incompatibility. The author observed one individual isolated in the field and another grown in a greenhouse which set seed rather abundantly with their own pollen.

A non-bitter variety of Melilotus, R. A. Brink (*Science, 79 (1934), No. 2048, p. 301*).—A variety of sweetclover (*Melilotus* sp.), F.P.I. 90753, collected by the U.S. Department of Agriculture near Peiping, China, in 1928, is described from Wisconsin Experiment Station studies as entirely free from the bitter, stinging taste characterizing the genus, annual in habit, from 15 to 34 in. high, and bearing small yellow flowers and smooth seeds. It appeared to be a variant of the biennial *M. suaveolens*, said to be closely related to *M. alba*.

Height of cutting sweet clover and influence of sweet clover on succeeding oat yields, G. Stewart (*Jour. Amer. Soc. Agron. 26 (1934), No. 3, pp. 248, 249*).—White sweetclover cut 4 and 8 in. high in Utah Experiment Station tests made no or very little second growth, while that cut 12 in. high made full crops. Oats following white sweetclover produced more grain and protein per acre than after grass-legume pasture mixtures.

Size, shape, and orientation of plots and number of replications required in sweetpotato field-plot experiments, R. C. Thompson (*Jour. Agr. Res. [U.S.], 48 (1934), No. 5, pp. 379–399, figs. 8*).—The influence of plat size, shape, orientation, and number of replications on experimental error in field experiments was determined in plantings of Porto Rico sweetpotatoes made at Beltsville, Md., in 1929 and 1931, and at the South Carolina Pee Dee Substation, at Florence, in 1930 and 1931. Field data were assembled in both single- and multiple-row plats consisting of from one to twelve 15-ft. row units.

Increasing the size of individual units gave a significant reduction in standard deviation of plats up to about 90 linear ft. of row. Multiple-row plats were less variable than single-row plats of the same total row length and area. In shape-of-plat studies made within limits of the maximum plat size found to give significant reduction in variation, 90 linear ft. of row, with the exception of an 18 by 15 ft. plat, the greater dimension paralleled the direction of the rows. Variation among plats decreased as the shape approached a square. The 18 by 15 ft. areas gave a very significant reduction in variation compared with the 3 by 90 ft. single-row plats.

Variation decreased as the plat dimension at right angles to the direction of the rows was increased. The number of replications of various-sized plats required for significance of a stated percentage difference varied with the different lots. Small plats required more replications for a given degree of accuracy and greater expense and labor in planting and harvesting than did large plats, yet a significant saving in land occurred with small units.

Indications were that a plat consisting of about 90 linear ft. of row replicated 4 or 5 times should give a satisfactory plat arrangement. A more significant reduction in variation in plat yields might be expected if the 90 ft. of row is divided into a number of shorter parallel rows than where a 90-ft. single-row unit is used.

Effects of applications of nitrate of soda upon the yields of timothy hay and seed, M. W. Evans (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 235–240, fig. 1*).—When sodium nitrate was applied at rates of 40, 80, 160, and 320 lb. per acre in three seasons on a Huron timothy meadow about 5 to 7 yr. old, in cooperative tests at North Ridgeville, Ohio, by the U.S. Department of Agriculture and the Ohio Experiment Station (E.S.R., 63, p. 36), its effects upon the yields of hay and seed varied with the rainfall in April, May, and June. In a season with low rainfall both hay and seed yields were also low. The most hay was obtained in the season with the greatest spring rainfall, while seed yields were somewhat larger in the season when the spring rainfall was slightly below normal. As the rate of application was increased, a gradual decrease occurred in the additional quantity of hay and of seed produced for each pound of fertilizer used, although for each rate the resulting increase in seed yield was greater than the corresponding increase in hay. Except on plats fertilized at the two heaviest rates in the season with the greatest spring rainfall, plants did not tend to make a vigorous vegetative growth at the expense of seed production. The effectiveness of sodium nitrate in increasing yields of hay and seed in this experiment might be attributed largely to the small quantities of available nitrogen usually occurring in soils which have produced timothy for several years.

Fertilizer tests with tobacco, J. E. McMurtrey, Jr., W. M. Lunn, and D. E. Brown (*Maryland Sta. Bul. 358 (1934), pp. 255–290, figs. 12*).—Further experiments (E.S.R., 41, p. 143) with tobacco from 1919 to 1932 on Collington fine sandy loam at Upper Marlboro, Md., in cooperation with the U.S. Department of Agriculture, dealt primarily with the effects of different sources and quantities of nitrogen and potassium on yield and quality of tobacco in continuous culture.

When used alone as sources of nitrogen with a basal application of 1,000 lb. of 0–6–4 fertilizer, urea and ammonium nitrate were about as effective as the standards, sodium nitrate and ammonium sulfate, in increasing yields and value. Ammo-phos (chiefly ammonium phosphate) gave satisfactory results following the use of magnesian limestone to furnish calcium, while cyanamide and ammonium chloride were unsatisfactory as sole sources of nitrogen.

The importance of supplying elements secondary to the nitrogen, phosphorus, and potassium was emphasized by unsatisfactory results obtained with mixtures of potassium nitrate and mono-ammonium phosphate. Addition of magnesian limestone to this mixture decidedly improved crop growth. In addition to the calcium and magnesia, the use of sulfur as gypsum and epsom salt gave an earlier start in growth immediately following transplanting. Results from mixtures supplying only nitrogen, phosphorus, and potassium indicating that benefits from addition of magnesian limestone are due chiefly to the calcium and magnesia supplied and not to correction of soil acidity led to the recommendation that this form of limestone be used for tobacco only for calcium and magnesium when they are not supplied by other materials, for excessive liming often causes conditions favorable for black root rot.

Under the test conditions, 30 to 40 lb. per acre of nitrogen gave best results, and 120 lb. of potash derived from potassium sulfate per acre usually gave the most profitable returns. Its adverse action on fire-holding capacity and

other elements of quality in the leaf made potassium chloride undesirable as a source of potash. The protective action of potash at the higher rates, i.e., 264 and 360 lb. per acre in seasons when leaf-spot diseases caused severe losses, appeared to justify an increase in the quantity of potash above the 120-lb. rate to insure against these diseases. The tests suggested that a fertilizer mixture composed of the materials shown to be satisfactory and used at rates of 750 to 1,000 lb. per acre should contain 4 percent of nitrogen, 8 of phosphoric acid, and 12 or more of potash.

The nitrogen nutrition of tobacco, W. W. GARNER, C. W. BACON, J. D. BOWLING, and D. E. BROWN (*U.S. Dept. Agr., Tech. Bul. 414 (1934), pp. 78, figs. 9*).—Field plat tests were made in cooperation with the Maryland Experiment Station from 4 to 11 yr. on Collington fine sandy loam and loamy sand at Upper Marlboro to determine the best quantity of nitrogen needed for the southern Maryland type of tobacco and to compare the older inorganic forms of nitrogen and some new synthetic products. Certain features of the work are also noted above. The crop also was utilized for observations on the effects of variation in the nitrogen supply on growth and developmental relations and associated internal processes of nutrition and metabolism.

Application of 80 lb. of nitrogen per acre did not outyield significantly 40 lb. except with split treatments. Considering both yield and quality, the most profitable returns were obtained with 30 to 40 lb. of nitrogen. The nitrate and ammonia forms were about equally effective in increasing the crop yield when the effects of other ions in the nitrogen compounds or in the soil were considered. Ammonium sulfate and sodium nitrate were equally effective, while ammonium nitrate gave somewhat superior results. Ammonium chloride gave relatively high yields because of the stimulating effect of the chloride ion, which, however, impaired the quality of the leaf. Effects of other carriers are pointed out. Attempts to apply the Mitscherlich law to the yield data gave unsatisfactory results.

A moderate nitrogen supply produced the most rapid increase in height and favored early flowering and early ripening of the leaves. Higher nitrogen supply decidedly increased the area and the width: length ratio of the individual leaf, reduced their dry weight per unit of area and thickness, and lowered combustibility, but had little effect on number of leaves developed. The recovery of fertilizer nitrogen by the crop ranged from 40 to 90 percent when 20 lb. per acre were applied, depending upon midsummer rainfall, but was much lower for the higher rates. The stalks contained a slightly higher percentage of nitrogen than the leaves. A progressive increase in nitrogen content was noted from the ground leaf upward to the top leaf of the plant. Nitrogen deficiency, characterized by a pale yellowish-green color of the lower leaves, usually appeared when the nitrogen content of the leaf fell below about 1.5 percent. An outstanding effect of increased nitrogen supply was an increase in the water content of the leaf throughout growth, which seemed to be an important factor in the increase in area and reduced weight per unit of area of the leaf.

During the growth period preceding flowering the total and protein nitrogen contents in the lower leaves were increased materially only by the first 20 lb. per acre of fertilizer nitrogen, and additional nitrogen from heavier fertilization was used mostly in increasing the leaf area. Likewise, the progressive decrease per unit of area in total and in protein nitrogen during growth at all rates of nitrogen fertilization was due chiefly to transfer of nitrogen from older tissues to growing portions of the individual leaf. In the mature leaf the total, protein, and nicotine nitrogen contents increased with each increase in nitrogen fertilization. Marked increases of these constituents in the leaf also resulted

from low topping of the plant. In the mature leaf, before and after curing, a high nitrogen supply decreased the content of starch and increased the nonvolatile organic acids and catalase and peroxidase activity, but did not greatly affect sugars, total ash, tobacco resins, cellulose, or pectins.

Maryland tobacco, primarily a cigarette type, is characterized by high contents of cellulose and pectin, to which are due largely its light weight and dry character and in part its good burning qualities, and also by a low content of nicotine. These characteristics are best developed with a moderate nitrogen supply.

The Australian wheat Canberra and the Italian wheat Mentana in Greece [trans. title], J. S. Papadakis (*Inst. Kallit. Fyton Thessalonike Epist. Delt. 14 (1933), pp. 44; Eng. abs., pp. 25–28*).—Experiments during 8 yr. in northeastern Greece, where *Puccinia graminis* and drought at the critical period are major factors in wheat production, indicated that as gaged by yields, maturity, and reaction to drought and diseases, Mentana and Canberra are more profitable than indigenous wheats, and that Mentana is better than Canberra in fields not too dry and sandy. In baking quality Canberra nearly equals Deves, a good native wheat, while Mentana is considered inferior to both.

Effect of frost on wheat at progressive stages of maturity.—I, Physical characteristics of the kernels, R. Newton and A. G. McCalla (*Canad. Jour. Res., 10 (1934), No. 4, pp. 414–429, fig. 1*).—Another part of the program of investigations on the grading of frosted wheat, first reported on by Geddes, Malloch, and Larmour (E.S.R., 67, p. 242) is presented. Sample sheaves of freshly cut wheat were exposed in freezing chambers, then shock-cured, threshed, and compared with unfrozen check sheaves, in 1929, 1930, and 1932 at the University of Alberta. The checks attained about maximum grade and weight per bushel when cut at a stage of maturity represented by a dry matter content ranging in different varieties and seasons from 50 to 60 percent. The weight per 1,000 kernels of Marquis wheat, determined in 1930 only, reached a maximum at the same stage as weight per bushel. The susceptibility to superficial injury by frost continued generally over nearly the whole maturation period. Even 4° of frost (28° F.) often caused a cut in grade, while 8°, 10°, and 14° caused a more substantial degradation, often accompanied by reduction in weight per bushel. Marquis wheat seemed to be more susceptible than Garnet, Reward, and Red Bobs to degradation by frost during the maturation period. Grade, being based on external appearance, evidently is more sensitive to frost than are chemical composition and baking quality. Classification of the kernels of Marquis, in 1930, into vitreous, starchy, immature, green, bran frosted, and heavily frosted confirmed the earlier conclusion that only the sound class (vitreous plus starchy) is related enough to grade to be useful as a grading factor. Germination of Garnet was improved by moderate freezing.

Weed suppression by fertilizers and chemicals, H. C. Long (*London: London Caledonian Press Ltd., 1934, pp. X+57, [pls. 10], figs. [5]*).—Practical information is given on the control of weeds by fertilizers, especially ammonium sulfate, sodium nitrate, kainite, cyanamide, and lime, and by other materials, including sulfuric acid, sulfates of iron and copper, chlorates of sodium and potassium, arsenicals, and miscellaneous chemicals.

Use of sodium chlorate and other chemicals in controlling turf weeds, F. V. Grau (*Bul. U.S. Golf Assoc. Green Sect., 13 (1933), No. 6, pp. 154–179, figs. 5*).—The chemical control of weeds in turf was studied in 1932–33 on the University of Maryland campus and the Arlington, Va., turf garden, supplemented by tests in the Chicago district and on golf courses in Missouri, New

Jersey, and Indiana. Most of the work was conducted on loam, silt loam, and clay loam soils, and the results were not adequate for conclusions on sandy soils.

Sodium chlorate, arsenic pentoxide, ammonium thiocyanate, iron sulfate, and ammonium sulfate, in the order named, gave the best results of the chemicals tested. With sodium chlorate crabgrass was controlled best with three successive applications at the rate of 2 lb. per 1,000 sq. ft. Satisfactory control with lighter first and second applications was indicated, and suggestions are made as to rates and times of treatment. Under this treatment practically all other common turf weeds, as plantain, field sorrel, chickweeds, milk purslane, ground-ivy, heal-all, and speedwell, disappeared within a single season, and dandelion and goosegrass were discouraged, while wild garlic was little affected. With any of the chemicals used there was some discoloration of the turf. The chlorates of potassium, calcium, and magnesium may be substituted for sodium chlorate. The dry method of applying chlorates was found to be entirely satisfactory, and in addition it virtually eliminates the fire hazard, which is present when chlorates are used in solution. Sodium chlorate also was found satisfactory in large scale tests on golf courses.

Ammonium thiocyanate yielded results inferior to those with chlorates, and tended to encourage certain types of weeds, principally annual bluegrass and dandelion. Arsenic compounds, especially arsenic pentoxide, were used most successfully on fairway, lawn, and putting turf to selectively control clover, pennywort, ground-ivy, *Galium* sp., knotweed, chickweeds, and heal-all. Arsenic pentoxide apparently yields best results when sprinkled in successive treatments at rates not to exceed 0.5 to 0.75 lb. to 1,000 sq. ft. Indications were that earthworms and grubs may be controlled through the use of soluble arsenicals for weed control. Early-season treatments with arsenicals affected markedly the establishment of crabgrass, but had little effect when applied after the plants were established. Iron sulfate and ammonium sulfate, alone or in combinations, gave no indications of satisfactory crabgrass control, but were applicable in the control of broad-leaved, low-growing weeds, particularly those in putting greens. Over 2 yr. there apparently was no permanently injurious effect on soil treated with any of the chemicals used.

Control of ragwort on grassland, J. W. Deem (*New Zeal. Jour. Agr., 47 (1933), No. 2, pp. 99–104*).—The successful control of ragwort in grazing land by the use of sodium chlorate in spray solutions and dusts (5–10 percent of sodium chlorate in mixture with ground limestone or ground rock phosphate) is described, and the merits of the two methods are discussed.

HORTICULTURE

Plant propagation, H. B. Tukey (*New York State Sta. Circ. 138 (1934), pp. 24, figs. 13*).—General information is offered on the principles and practices of fruit and ornamental plant propagation by graftage, budding, cuttage, layering, seeds, etc.

Root grafting in trees, C. D. La Rue (*Amer. Jour. Bot., 21 (1934), No. 3, pp. 121–126, figs. 2*).—As found at the University of Michigan, root grafts are not uncommon in white pine, American arborvitae, American elm, yellow birch, American linden, and silver maple. On the other hand the roots of American larch, black ash, and black cherry did not appear to unite readily. What appeared to be actual grafts were observed between the yellow birch and the American elm and between the yellow birch and the silver maple. Soil was obviously a factor in inducing root grafting by pressing the adjacent roots firmly together.

[Horticulture at the Arkansas Station] (*Arkansas Sta. Bul. 297 (1934), pp. 81–85, 90, 91, 92, 93, 96, 97, 98, 100, 101, fig. 1*).—Brief reviews are presented of progress in studies carried on by the station since its establishment relating to pollination, spur performance, and fruit bud formation in the apple; fertilizers for bearing and immature apple trees; the pruning and training of the apple; cover crops for the apple; fertilizers for the peach; fertilizers, culture, pruning, and stocks for grapes; fertilizers and mulches for strawberries; fertilizers and lime for cantaloups; and the fertilizing and pruning of tomatoes.

[Horticulture at the Iowa Station], E. W. Lindstrom, E. C. Volz, T. J. Maney, B. S. Pickett, H. H. Plagge, H. L. Lantz, V. T. Stoutemeyer, H. Giese, E. S. Haber, A. T. Erwin, P. M. Nelson, P. Swanson, and G. S. Shepherd (*Iowa Sta. Rpt. 1933, pp. 112, 113, 114, 123, 124, 125–132, 133–135, 136, figs. 4*).—Among studies briefly reviewed are those relating to the inheritance of fruit size and shape in the tomato; the inbreeding and top crossing of sweet corn; the storage of gladiolus corms; the breeding of chrysanthemums, carnations, and amaryllis; the testing of gladiolus varieties; methods of propagating apples on their own roots; the growing of uniform stocks in apple propagation; the correlation of bound water with hardiness in apple wood; the development of new stocks for apples; systems of soil management for apple orchards; the response of apples to storage temperatures; the effects of continued application of nitrates on the composition and keeping quality of apples; apple, pear, plum, and peach breeding; apple variety tests; pruning of the grape; hybridization of black raspberries with reference to anthracnose resistance; propagation of Colorado blue spruce and other difficult and unusual plants; natural and cool air storage for apples; asparagus culture; pectin changes in stored tomatoes; classification of garden peppers; the breeding of cucurbits; the association of vitamin A with nutritional conditions in plants; factors affecting the quality and marketing of cantaloups; varieties of beans; and ineffectual attempts to cross snap and lima beans.

[Horticulture at the Louisiana Station] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 19, 20*).—Brief reports of recent work are presented on the breeding of cabbage, collards, peppers, and shallots, and on the fertilizing of cabbage and bush beans.

[Horticulture at the Maine Station] (*Maine Sta. Bul. 369 (1933), pp. 536–549, figs. 8*).—Included in this report are results of studies of canning pea varieties; fertilizer and lime requirements of sweet corn and beans, by J. A. Chucka, R. M. Bailey, and D. B. Lovejoy; the breeding and pollination of the apple, bud selection in the McIntosh apple, yield and growth of Golden Delicious apple trees as influenced by the tying down of branches, varieties of strawberries and raspberries, the breeding of sweet corn and beans, varieties of vegetables, the effect of staking and pruning on the earliness of tomatoes, and the breeding of cucumbers resistant to scab (*Cladosporium cucumerinum*), all by Bailey and I. M. Burgess; fertilizers for blueberries, by F. B. Chandler, Chucka, and I. C. Mason; and pollination and sterility in blueberries, and weed control in blueberry fields, both by Chandler and Mason.

[Horticultural studies by the Massachusetts Station] (*Massachusetts Sta. Bul. 305 (1934), pp. 11–13, 21, 22, 24, 25, 41, 42, 45–47, 50–55, 60, 61*).—Among experimental results briefly reported are those dealing with onion set production, onion transplanting, and onion breeding, all by M. E. Snell; the forcing of gladiolus with supplemental light and the effect of different types of plant containers on growth, both by L. H. Jones; the development of strains of cranberries resistant to false blossom, by H. F. Bergman, W. E. Truran, and J. F.

Kelley; the relation of oxygen content of flooding waters to injury in cranberry bogs, by Bergman and Truran; the regeneration of bogs injured by false blossom, by Bergman and Kelley; spraying of cranberries with Bordeaux mixture, by Bergman, Truran, and Kelley; the storing of cranberries, by Bergman and Truran; the breeding of snapdragons for improvement and disease resistance, the effect of various nutrients on carnations, and varieties and culture of China asters, all by H. E. White; fertilizer and cultural studies with asparagus and improvement of squash, peppers, tomatoes, beets, and other vegetables by plant selection, both by R. E. Young; the interrelation of stock and scion in apples, by J. K. Shaw; tree characters of certain fruits, by Shaw and A. P. French; the genetic composition of peaches, by J. S. Bailey and French; the effect of pruning on bearing trees, by Shaw and O. C. Roberts; cultural and fertilizer studies with fruit trees, by Shaw; varieties of tree fruits, by Shaw and Roberts; fruit bud formation in the strawberry, by R. A. Van Meter; storage of apples, by Roberts, C. I. Gunness, and W. R. Cole; blueberry culture, by Bailey; and the use of electricity as heat for orchards and benches and tests of sweet corn and tomato varieties, both by P. W. Dempsey. Part of the work was in cooperation with the U.S. Department of Agriculture.

[Horticultural studies by the New Hampshire Station] (*New Hampshire Sta. Bul. 280 (1934), pp. 11–16*).—Among studies discussed are the effect of phosphorus fertilizers on the apple, by G. F. Potter; the relation of spur composition to fruit bud formation in the apple, by Potter and T. G. Phillips; pollination requirements of the McIntosh apple, by L. P. Latimer; storage needs of the McIntosh, Cortland, and Baldwin apples, and the effect of soil treatment and fertilizers on the keeping of the Baldwin, both by E. J. Rasmussen; the removal of spray residues from apples, by G. P. Percival and Potter; fertilizer requirements of blueberries, by Latimer; fertilizer requirements of strawberries; testing of new varieties of apples, pears, and raspberries, by Latimer; fertilizer for cabbage, by J. R. Hepler; value of nitrogen for apple orchards, by Potter; source of seed influence in vegetable production, use of electric hotbeds during winter, sand as a cultural medium for tomatoes, the comparative value of stable manure and peat moss as organic matter for the tomato, and testing of sweet corn and tomato varieties, all by Hepler; and the effect of pruning on the yield of red raspberries, by Latimer.

The quality of vegetable seeds on sale in New York in 1933, M. T. Munn (*New York State Sta. Bul. 642 (1934), pp. 69, figs. 10*).—Continuing the series (E.S.R., 69, p. 210), herein are presented, largely in tabular form the results of purity and germination tests of 864 samples of vegetable seeds purchased in the open markets of the State during the planting season of 1933. Field tests were made of 487 of the seed samples of beans, cabbages, and tomatoes. Approximately 10 percent of the seed obtained in sealed packets of the commission-box type was practically worthless, and a large percentage only fair or average in quality.

Crossed sweet corn, D. F. Jones and W. R. Singleton (*Connecticut [New Haven] Sta. Bul. 361 (1934), pp. 487–536, figs. 30*).—Based on extensive studies in corn improvement at the station, general information is given on the entire program of producing high-yielding, uniform, and disease-resistant sweet corns by inbreeding and subsequent recombination. Among items discussed are the technic of inbreeding, the selection of desirable inbred lines, hybrid vigor resulting from recombination of inbred lines, new corns obtained by such combining the technic of crossing, and the general handling of the various field operations The comparative merits of single, double, multiple, and top crosses in corn improvement are considered. The hybrid sweet corns Redgreen, Crossgreen

Yellow Cross, Green Cross, and Whipple Cross are described in considerable detail.

Descriptions of types of principal American varieties of cabbage, V. R. Boswell, W. C. Edmundson, O. H. Pearson, J. E. Knott, C. E. Myers, R. A. McGinty, W. H. Friend, H. H. Zimmerley, and J. C. Walker (*U.S. Dept. Agr., Misc. Pub. 169 (1934), pp. 22, pls. 18*).—The second of a series (E.S.R., 71, p. 43) devoted to the standardization of the leading varieties of American vegetables, this paper presents detailed descriptions of the Early Jersey Wakefield, Copenhagen Market, Charleston Wakefield, Early Winnigstadt, Glory of Enkhuizen, All Seasons, Late Flat Dutch, Danish Ballhead, and Wisconsin Hollander cabbage varieties based on correlated studies conducted in widely separated locations.

Descriptions of types of principal American varieties of garden peas, D. N. Shoemaker and E. J. Delwiche (*U.S. Dept. Agr., Misc. Pub. 170 (1934), pp. 39, pls. 7, figs. 24*).—The third of a series which has already included the tomato and the cabbage, this paper describes several important pea varieties, namely, Alaska, Green Admiral, Surprise, World Record, Gradus, Thomas Laxton, Admiral, Telephone, Alderman, Little Gem, Little Marvel, Hundredfold, Perfection, Advancer, Progress, Laxtonian, Daisy, and Sutton Excelsior.

Rooting habit of Northern Spy apple stocks, C. E. Woodhead (*New Zeal. Jour. Agr., 47 (1933), No. 6, pp. 362–365, figs. 4*).—Reporting further (E.S.R., 70, p. 185), the author points out the sharp differences between the rooting habits of 2-year-old Northern Spy trees produced from root cuttings and those produced by layering. The cuttings produced strong and almost vertical roots, whereas the roots of the layered plants were relatively slender and horizontal. The cutting plants averaged 3½ in. in girth and the layered plants 2⅝ in. Observations on 4-year-old layered trees showed that the root characters persisted, but whether they would be permanent differences was only conjectured.

How much nitrogen do apple trees need? R. H. Roberts (*Wisconsin Sta. Bul. 427 (1934), pp. 8, figs. 6*).—Decrying the practice of systematic application of nitrogen to apple trees without regard to differences in soils, varieties, or tree individuality, the author discusses the various indexes to nitrogen needs of apple trees, such as twig length and diameter and color of the bark and foliage. Diameter of twigs is considered a better index of fruiting capacity than is length. Although different varieties, due to differences in bearing habits, have different nitrogen requirements, the overvegetative condition of each appears to be related to slender-type growth. An excess nitrogen condition is said to aggravate the injury from drought and certain forms of spray injury. Partial defoliation early in the growing season from scab or insects produces a relatively high nitrogen tree by limitation of photosynthetic activity and consequent deficiency of carbohydrates.

Summing up, the author urges the use of nitrogen according to the growth and fruiting condition of the trees and not by rule.

Culinary quality in Minnesota varieties of apples, A. M. Child and W. G. Brierley (*Minn. Hort., 62 (1934), No. 6, pp. 108, 109*).—Tests at the Minnesota Experiment Station of 42 varieties of apples taken from storage at 34° F. showed Wealthy and Minnesota No. 995 to be excellent for apple sauce; Boiken, Folwell, Hawkeye, Jewell, Milwaukee, and Minnesota seedlings 488, 643, 876, and 995 very good for baking; Colorado Orange, Haralson, Jonathan, Judson, King David, Minnesota No. 876, and University very good for coddling; and McIntosh excellent and Cortland, Fameuse, Jonathan, Minnehaha, Wealthy, and Minnesota No. 1007 very good for dessert purposes.

Ornamental apples and crabapples, G. P. Van Eseltine (*New York State Sta. Circ. 139 (1934), pp. 13, fig. 1*).—Notes are presented on a large number

of ornamental apples and crab apples, preceded by general information on propagation, pruning, culture, classification, etc.

Fruits for roadside markets (*New York State Sta. Circ. 144 (1934), pp. 17, fig. 1*).—Accompanied by brief descriptive and commentary notes, there is presented a succession of the various fruits adapted for roadside marketing in New York State.

Small-fruit culture, J. S. Shoemaker (*Philadelphia: P. Blakiston's Son & Co., 1934, pp. XV+434, figs. 52*).—Presented in six parts devoted, respectively, to the grape, strawberry, bramble fruits, currant and gooseberry, blueberry, and cranberry, this book presents general cultural and other information, based largely on the results of research with the various fruits.

Four years of commercial fertilizers on currants in the Hudson River Valley, L. C. Anderson (*New York State Sta. Bul. 641 (1934), pp. 13, fig. 1*).—In these experiments, designed to study the effects of nitrogen, phosphorus, and potash alone and in different combinations, no evidence was found that phosphorus or potash, either alone or in combination, was beneficial to the currant. Nitrogen did give a definite response, but there was no significant difference between any of the seven carriers used, namely, Nitrophoska, Ammo-Phos, urea, cyanamide, ammonium sulfate, calcium nitrate, and sodium nitrate.

That previous soil treatments have a profound influence on currants was indicated in the yield of plants on an area formerly a hog yard, but even here applied nitrogen increased yields to a profitable degree. Contrary effects were observed on an area formerly an orchard of mature Rhode Island Greening apples. Here the bushes were small, foliage sparse, and yields low, even with supplied nitrogen. However, poor culture due to the presence of stumps was a factor in low production.

Yield and quality of fruit from strongly vegetative Concord grape vines, W. H. Upshall and J. R. van Haarlem (*Sci. Agr., 14 (1934), No. 8, pp. 438–440, fig. 1; Fr. abs., pp. 441, 442*).—Observations at the Ontario Horticultural Experiment Station on 27 plats of unfertilized Concord vines, all pruned to the 6-arm Kniffin system, showed considerable variations in growth, the prunings from the least vegetative plat averaging 2.1 lb. per vine per year over 5 yr. as compared with 4.6 lb. for the most vegetative plat. However, the grapes on the weakest growing plats were highest in sugar and lowest in acids. High vegetativeness affected quality relatively more in acid than in sugar content. The authors believe that growers when severely pruning strong vines are not only reducing the quantity but also the quality of the crop and suggest, therefore, lighter pruning of the more vigorous vines, or, in other words, to adapt the degree of pruning to the condition of the individual plant.

Nutritional studies with Fragaria.—II, A study of the effect of deficient and excess potassium, phosphorus, magnesium, calcium, and sulphur, M. B. Davis, H. Hill, and F. B. Johnson (*Sci. Agr., 14 (1934), No. 8, pp. 411–432, figs. 4; Fr. abs., p. 441*).—In this second contribution (E.S.R., 59, p. 838), the authors discuss the results of a study at the Central Experimental Farm, Ottawa, of the effects of deficient and excess K, P, Mg, Ca, and S on Parson Beauty strawberry plants introduced from the field in the spring of their second year, replanted in pots of ground sandstone, and supplied nutrient solutions of known composition at regular intervals in predetermined quantities. Certain definite foliage symptoms were noted which are said to be of diagnostic value.

Ash analysis of the leaves revealed a marked influence of nutritional treatment on composition. All omissions were reflected by a reduction of the element concerned in both ash and in dry matter. Certain interesting relationships were observed between elements in the ash. For example, there were

determined the following correlations: K_2O and CaO -0.6724 ± 0.049, K_2O and MgO -0.6893 ± 0.047, K_2O and P_2O_5 -0.4979 ± 0.067, CaO and MgO $+0.319\pm0.08$, MgO and P_2O_5 $+0.5431\pm0.063$, and CaO and P_2O_5 $+0.1103\pm0.088$. Thus certain elements were apparently antagonistic to one another.

A deficiency of K had a pronounced effect in reducing winter hardiness and at the same time markedly reduced the total carbohydrates, as determined by analyses of tops collected in October of the year prior to fruiting. Deficiency in P, Mg, Ca, and S also reduced the carbohydrate content of the tops. Strawberries appeared capable of utilizing their original K to a marked extent. Apparently significant positive correlations were observed between the N supplied and the amounts of K and P in the ash, and there was determined a highly significant negative correlation between the N supplied and the Ca found, indicating that high N tends to decrease the absorption of Ca.

Note on the progeny of a single cacao tree, F. J. Pound (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 2 (1932), pp. 25, 26*).—Records taken on 80 cacao trees, all the open-pollinated progeny of a single consistently high-producing parent characterized by very dark red pods, showed 32 of the seedlings to bear fruits as dark as those of the parent and most of the remainder only slightly lighter in color. None was completely without pigment. With respect to other pod characters, 20 of the seedlings had the characteristic point of the parent, 56 were smooth skinned like the parent, and 63 had medium furrows like the parent. In quantitative characters there was observed a striking correspondence of the progeny mode with the parental mean in such characters as length, diameter, and thickness of pods, number of beans, and green weight.

The vegetative propagation of cacao.—II, Softwood cuttings, E. E. Pyke (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 2 (1932), pp. 3–9*).—Continuing earlier studies (E.S.R., 68, p. 763), the author found that the maximum success, both as to percentage of rooted cuttings and their subsequent establishment, was obtained with vigorous flushes taken from young trees growing under medium shade. Very poor results were secured with cuttings from trees growing under light shade or no shade. The failure of cuttings to retain leaves in the propagating frame always resulted in little or no rooting. Good success was secured with cuttings from chupon suckers sent up from the base of the trunk and occasionally from aerial branches, provided the wood was somewhat mature. The roots from chupon cuttings took a downward course as soon as they emerged from the stem, whereas the roots of fan cuttings grew almost horizontally for several centimeters. Of various propagating devices tested, the best results were secured with a shaded concrete coldframe having independent chambers. In this frame as high as 90 percent of rooting was secured. The shortest time required for rooting was 11 days.

Aster culture, E. R. Honeywell (*Indiana Sta. Circ. 200 (1933), pp. 20, figs. 11*).—General information is presented on varieties, culture, disease and insect control, handling of blossoms for market, etc. The use of artificial light supplementing daylight permitted the production of a midwinter crop of excellent asters. In the field seedlings of certain varieties, when lighted immediately after germination for from 7 to 26 days, bloomed as much as 2 weeks earlier than usual. None of 300 varieties and strains tested were found fully immune to *Fusarium* wilt, but some showed high resistance. There appeared to be several strains of *Fusarium* wilt attacking the aster.

Hardy chrysanthemums, C. H. Connors (*New Jersey Stas. Circ. 315 (1934), pp. 4*).—General information is presented on culture, training, disbudding, winter protection, pest control, types and varieties, etc.

Some hybrid Martagon lilies, D. GRIFFITHS (*U.S. Dept. Agr. Circ. 299 (1933), pp. 15, pls. 7*).—Descriptive accounts are presented of certain highly promising, recently named first generation hybrid lilies selected from a large population of seedlings produced from seed purchased from a commercial source. The species involved are believed to be *Lilium humboldti*, *L. parryi*, and *L. pardalinum*, with the first named being consistently the mother parent. Three of the new varieties, namely, Star of Oregon, Kulshan, and Cyrus Gates, as grown at Bellingham, Wash., generally produced stalks from 5 to 7 ft. high the second year after scaling, and 30 flowers to a stem were not unusual in the Frances Larrabee variety.

Hybrid Nymphaeas: Their creation, propagation, and cultivation, G. H. P[RING] (*Missouri Bot. Gard. Bul., 22 (1934), No. 3, pp. 93–108, pls. 7, fig. 1*).—In presenting a tabulation of pollinations made during the years 1930–33, inclusive, general information is added with reference to the technic of pollination, methods of handling young seedlings, etc.

How to feed a shade tree, A. P. B[EILMANN] (*Missouri Bot. Gard. Bul., 22 (1934), No. 4, pp. 113–126, pls. 5, figs. 4*).—General information is offered on the nutrition of shade trees, suggesting that trees may effectively utilize large amounts of commercial fertilizer. Excellent results were secured from applications of 25 lb. of a 10–8–6 material to walnut, oak, and other trees.

FORESTRY

The effect of cultivating young black locust, H. G. MEGINNIS (*Jour. Forestry, 32 (1934), No. 5, pp. 569–571, fig. 1*).—The cultivation of young locust planted in the early spring of 1933 on plowed, eroded land near Holly Springs, Miss., so stimulated the young trees that at the end of the first growing season the cultivated trees were 17 percent taller than the uncultivated. Furthermore, the cultivated trees were provided with vigorous laterals and retained their foliage 3 weeks longer than the checks.

Fast growing redwood, W. HALLIN (*Jour. Forestry, 32 (1934), No. 5, pp. 612, 613*).—As reported by the California Forest and Range Experiment Station, a stand of redwood trees averaging 260 yr. of age was estimated by the international rule to contain 776,600 bd. ft. per acre, representing an average annual increment of 2,987 ft.

Grass, pine seedlings, and grazing, G. A. PEARSON (*Jour. Forestry, 32 (1934), No. 5, pp. 545–555, fig. 1*).—Seven plats, including two controls, one burned slightly before seeding, one denuded by cutting the grass below the root collar, and three clipped to heights of 2, 6, and 10 in., respectively, were laid out in 1928 within a fenced area which had been closed to all grazing since 1910. After preparation each plat was seeded to western yellow pine at the rate of 200 seeds per square meter. Good germination was secured on all plats, but counts 2 yr. later revealed large losses on the plats covered by tall grass. The mortality apparently was due to competition of the young trees with the grass for water and sunlight. A limited amount of vegetation is deemed beneficial, aiding in holding rainfall and retarding evaporation. Arizona fescue grass is described as unfavorable to pine seedlings, whereas mountain muhlenbergia and blue grama were much less harmful, the former because of its dormancy in the June and July drought period and the latter because of its low growth.

[The effect of rabbit injury on the forest stand] (*New Hampshire Sta. Bul. 280 (1934), p. 22*).—A tendency to improve the composition of the stand was noted.

A cordwood study, A. C. McIntyre (*Jour. Forestry, 32 (1934), No. 5, pp. 585–589, figs. 4*).—From measurements taken by the Pennsylvania Experiment Station in three areas where Virginia pine, pitch pine, and mountain pine were being cut for pulpwood, there were prepared curves showing the influence of the size of the average bolt on the number of pieces per cord, the effect of average tree size at breast height on the number of bolts per cord, and the effect of the number of bolts per cord on solid cubic foot contents, etc. With 40 bolts per cord there were 115.3 cu. ft. With an increased number of bolts there was a steady decline in cubic feet until with 200 the cubic foot content was 104.

Color variations in ponderosa pine oleoresins, W. P. David (*Jour. Forestry, 32 (1934), No. 5, p. 609*).—A green gum obtained from blackjack ponderosa pines in southern Idaho and in sharp contrast to the gray-white product usually obtained was found by the University of Idaho to have slightly different properties than the gray. The green color was traced to green algae present in the crude resin as it emerged from the tree.

DISEASES OF PLANTS

Recent trends in plant quarantine, A. C. Fleury (*Calif. Dept. Agr. Mo. Bul., 23 (1934), No. 1, pp. 62–66*).—The author considers the relation of automobile traffic and increasing air transportation to the problem of plant quarantine. He discusses the apparent tendency in some quarters to advocate partial or complete Federal control of all interstate plant quarantines.

Some soil microbiological aspects of plant pathology, G. B. Sanford (*Sci. Agr., 13 (1933), No. 10, pp. 638–641; Fr. abs., p. 668*).—Plant parasitic organisms normally inhabiting the soil are discussed in reference to the microbiological activities of the soil, which may at times have a suppressive influence on their persistence or multiplication, or the reverse. The importance of a greater study of such relationships in plant disease investigations is stressed.

Interesting new Fusaria, O. A. Reinking (*Zentbl. Bakt. [etc.], 2. Abt., 89 (1934), No. 25–26, pp. 509–514, figs. 4; Ger. abs., p. 513*).—The author describes in Latin and illustrates the spore form of *Fusarium sublunatum* n.sp. from surface soil in banana and cacao plantations in Costa Rica and Panama, *F. elongatum* n.sp. from surface soil in banana and cacao plantations in Costa Rica, *F. concolor* n.sp. from the base of a diseased plant of barley in Uruguay, and *F. tumidum* Sherb. var. *humi* n.v. from soil in Honduras.

Irradiation of plant viruses and of microorganisms with monochromatic light, I, II, B. M. Duggar and A. Hollaender (*Jour. Bact., 27 (1934), No. 3, pp. 219–239, figs. 6; 241–256, figs. 7*).—Two papers are presented from the University of Wisconsin.

I. *The virus of typical tobacco mosaic and Serratia marcescens as influenced by ultraviolet and visible light.*—The physical installation included, for most of the work, a fused quartz monochromator and an intense source of radiation provided by a capillary mercury vapor lamp. Special attention was given to the development of a suspension technic giving reproducible results and to a method whereby the virus and the bacteria might be satisfactorily irradiated simultaneously and in the same suspension. Exposures were made in a fused quartz cell (with stirring) in a water-ice bath (1° to 2° C.). The exposure suspension consisted of (1) semipurified virus and (2) bacteria taken during the logarithmic growth phase from a bouillon culture. Poured plates (agar) were made in dilution series for the bacterial counts, and inactivation of the virus was determined by the incidence of disease when inoculated into tobacco plants, comparing irradiated material with otherwise similarly treated controls.

Between the limits investigated, λ2,537 and λ6,120 a.u., the greatest influence was at λ2,652 a.u., and, in general, the energy values representing 100 percent killing of the bacteria were far below the values having any measureable effect on the virus.

II. *Resistance to ultraviolet radiation of a plant virus as contrasted with vegetative and spore stages of certain bacteria.*—A crystalline quartz monochromator and a new form of exposure cell, with stirrer, designed for suspension technic were employed. In resistance toward ultraviolet radiation the virus of typical tobacco mosaic was compared with vegetative forms of *Serratia marcescens* and *Bacillus subtilis* and with spore forms of *B. subtilis* and *B. megatherium*. Survivor curves are given for seven different wave lengths, from λ2,537 to λ3,652 a.u. While the curves for vegetative and spore stages of the bacteria are conformable, the level of energies required to give a particular survivor value is somewhat greater for the spores, and at any lethal wave length the resistance of spores of *B. megatherium* is greater than that of *B. subtilis*. The resistance of the virus irradiated coincidentally and in the same suspension with the bacteria is so much greater than spore stages as to be of a different order of magnitude. In general the maximum lethal effect was at λ2,652 a.u., although, according to these data, *B. megatherium* (spores) exhibits greater sensitivity at λ2,804 a.u. There is little relation between heat resistance and resistance toward ultraviolet radiation.—(*Courtesy Biol. Abs.*)

Studies on the antagonism of microorganisms, I–IV, S. Endō (*Bul. Miyazaki Col. Agr. and Forestry, Nos. 3 (1931), pp. 95–119, pl. 1; Japan. abs., p. 119; 4 (1932), pp. 133–158; Japan. abs., pp. 157, 158; 159–185; Japan. abs., p. 185; 5 (1933), pp. 51–75; Japan. abs., pp. 74, 75*).—Four papers are presented, as follows:

I. *Growth of Hypochnus centrifugus (Lév.) Tul. as influenced by the antagonistic action of other microorganisms.*—The author has conducted an extensive series of studies to learn whether there may be any practical value in the antagonistic action of soil bacteria and fungi toward micro-organisms that infest the soil and act as plant pathogens. He has worked with 26 species of bacteria and 62 species of fungi, growing them either in artificial culture media or in soil in test tubes in the presence of living mycelium or sclerotia of several species of fungi associated with the so-called sclerotial diseases of rice.

Eleven species of bacteria were found highly antagonistic to the growth of *H. centrifugus* on culture media. They infest the latter and retard its growth greatly. Eight other species of bacteria were also antagonistic to the growth of *H. centrifugus* on culture media, but in the case of these species both the bacterium and the fungus stopped growing, leaving a certain sterile region between them, the width of which varied with the species of bacteria. In contrast to this, 7 species of bacteria became covered by the mycelium of *H. centrifugus* on culture media, showing no distinct influence on its growth. Colonies of 62 species of fungi belonging to *Aspergillus, Penicillium, Mucor*, and *Absidia* were overgrown by the mycelium of *H. centrifugus* on culture media. When sclerotia or mycelia of *H. centrifugus* were infested on culture media by all species of bacteria comprised in the first group referred to, they were found dead after 21 days at 28° C., with one exception.

Most species of bacteria in the first and second groups mentioned above were antagonistic to *H. centrifugus* in soil, and two of these caused death of sclerotia after 21 days at 24°, 28°, and 32°. Some of the fungi grown with *H. centrifugus* increased sclerotium formation, others decreased it. Thus some of the micro-organisms in the soil may prove to be a factor in preventing the development of the fungus under natural conditions.

II. *Growth of Hypochnus sasakii Shirai as influenced by the antagonistic action of other microorganisms.*—Twenty-six species of bacteria and 29 species of fungi were found to be antagonistic to the growth of *H. sasakii* on the culture media. They infest the latter fungus and retard its growth. Three species of bacteria and 11 species of fungi on the culture media were found to have no antagonistic effect. One species of *Penicillium* is somewhat antagonistic to *H. sasakii.* Both organisms start growing and leave a sterile region between them. When the sclerotia and mycelia of *H. sasakii* were covered by the growth of 24 species of bacteria individually, the fungus organs referred to were killed within 21 days at 28°. There are 15 species of bacteria and 5 species of *Aspergillus* which cause the death of sclerotia and mycelia of *H. sasakii* in soil within 21 days at 24°, 28°, and 32°.

III. *Pathogenicity of Hypochnus centrifugus (Lév.) Tul. and Hypochnus sasakii Shirai in the presence of other microorganisms.*—In these tests 12 species of bacteria and 5 species of *Aspergillus* were found able to weaken the pathogenicity of *H. centrifugus* in the soil. Fifteen species of bacteria, 3 of *Aspergillus*, 4 of *Penicillium*, and 1 of *Mucor* were found to weaken the pathogenicity of *H. sasakii* in the soil. Ten species of *Aspergillus*, 3 of *Penicillium*, and 5 species of bacteria proved so highly antagonistic to *H. sasakii* that they prevented entirely the appearance of sclerotial disease on the stems of rice.

IV. *Growth and pathogenicity of Sclerotium oryzae-sativae Sawada in the presence of other microorganisms.*—Seventeen species of bacteria, 14 species of *Aspergillus*, including 16 stock strains of *A. niger*, 2 species of *Penicillium*, and 1 each of *Mucor* and *Absidia* were antagonistic to the growth of *S. oryzae-sativae* (the rice stem and root rot organism) in agar cultures. Four other species of *Penicillium*, 1 of *Mucor*, and 1 species of bacterium had no effect on *S. oryzae-sativae* but were overgrown by it. Eight species of *Aspergillus*, 1 of *Penicillium*, and 8 species of bacteria proved antagonistic to the organism in the soil and weakened its pathogenicity. The death of sclerotia in the soil was produced within 21 days by several of the organisms tested.

The influence of soil reaction on the behavior of parasitic fungi and on host plant relations [trans. title], E. SCHAFFNIT and K. MEYER-HERMANN (*Phytopath. Ztschr., 2 (1930), No. 2, pp. 99–166, figs. 21*).—Part 1 (pp. 1–12) is a critical analysis of the subject. In the tests described in part 2, potato was inoculated through the soil with *Synchytrium endobioticum;* kohlrabi, with *Plasmodiophora brassicae* and *Moniliopsis aderholdii;* beet, with *Rhizoctonia solani, Phoma betae,* and *Pythium debaryanum;* lupine and tobacco, with *Thielavia basicola;* winter rye, with *Calonectria graminicola* (*Fusarium nivale*), *F. culmorum, F. equiseti, F. avenaceum, F. herbarum, F. aurantiacum,* and *F. polymorphum;* winter barley, with *Helminthosporium sativum;* winter wheat, with *Ophiobolus graminis;* and summer wheat, with *O. herpotrichus* and *Erysiphe graminis.* These experiments were performed in glazed clay pots at various ranges of soil pH. They were supplemented by cultivating the fungi (excepting *S. endobioticum, Plasmodiophora brassicae,* and *E. graminis,* but including also *R. violacea* and *Typhula graminum*) saprophytically in soils of varying pH and measuring the rates of growth.

The influence of soil reaction was without practical disease-control value with *R. solani, Phoma betae, M. aderholdii, Thielavia basicola, F. culmorum, F. avenaceum,* and *H. sativum.* Although the optimum pH for growth of *S. endobioticum* and *R. violacea* was distinctly low, ability to grow at higher concentrations precludes field control of the former by liming. *C. graminicola, Typhula graminum,* and *O. graminis* required an alkaline reaction. The latter alone survived an acidic soil for a time, but caused little injury at pH 4.81

and 4.03 to winter wheat. *Plasmodiophora brassicae* was practicaly controlled by maintaining pH 7.5. Complete control by further increasing alkalinity entails the danger of excess lime injury.—(*Courtesy Biol. Abs.*)

The cause and control of chlorosis in western Kansas, H. E. MYERS and E. W. JOHNSON (*Kans. Acad. Sci. Trans., 36 (1933), pp. 106–110, figs. 4*).—Greenhouse and field studies showed that a deficiency of iron in the leaves is the cause of the chlorosis so prevalent in many plants in western Kansas. Field results indicate that the most satisfactory means of control is a spray of ferrous sulfate.—(*Courtesy Biol. Abs.*)

[Papers presented at the twenty-fifth annual meeting of the American Phytopathological Society, Boston, Mass., December 28–30, 1933] (*Phytopathology, 24 (1934), No. 1, pp. 3–21*).—Included are abstracts of the following papers presented at this meeting: Methods of Spore Measurement in the *Actinomyces*, by F. M. Blodgett (p. 3); Stimulation of Potatoes by Magnesium Bordeaux Spray, by R. Bonde (p. 3); Strawberry Dwarf in Massachusetts, by O. C. Boyd, J. R. Christie, and N. E. Stevens (p. 3); A Mosaic Disease of Bulbous Iris, by P. Brierley and F. P. McWhorter (p. 4); Attempted Removal of Staling Substances of Fungus Cultures, by J. C. Carter (p. 4); Fungi and Bacteria on Barley, by J. J. Christensen and E. C. Stakman (pp. 4, 5); Progress in the Control of Tobacco Downy Mildew, by E. E. Clayton and J. G. Gaines (p. 5); Winter Injury and Drought in Relation to Apple Root Rot (*Xylaria mali*), by J. S. Cooley (p. 5); Fungicidal Control of *Gymnosporangium juniperi-virginianae* and Related Species (pp. 5, 6) and Relative Susceptibility of the Species of *Malus* to *Gymnosporangium juniperi-virginianae* (p. 6), both by I. H. Crowell; Twig Blight (*Hypomyces ipomoeae*) of the American Bladder Nut, by W. H. Davis (p. 6); Cortical Parasitism of Conifer-Seedling Roots in Pure Culture by Mycorrhizal and Nonmycorrhizal Fungi (pp. 6, 7) and Fungi that Produce Ectotrophic Mycorrhizae of Conifers (p. 7), both by K. D. Doak; *Pythium butleri* and *P. aphanidermatum* (p. 7) and Vascular Wilt and Root Rot of Pansies Due to *Aphanomyces* sp. (pp. 7, 8), both by C. Drechsler; Spraying and Dusting of Tomatoes for Late Blight (*Phytophthora infestans*), by A. A. Dunlap (p. 8); Seed Treatment Studies of Spinach, by L. E. Erwin and F. K. Crandall (p. 8); Comparing Soil Fungicides with Special Reference to *Phymatotrichum omnivorum* Root Rot, by W. N. Ezekiel and J. J. Taubenhaus (p. 8); Soil Treatment with Mercurials for Control of Potato Scab, by C. W. Frutchey and J. H. Muncie (p. 9); A Leaf Nematode Disease of Begonia, by D. L. Gill (p. 9); Sulphur Vaporation with Rupprecht's Sulfurator in Greenhouse-Crop Prophylaxis, by E. F. Guba (p. 9); Control of the Narcissus Leaf-Scorch under Long Island Conditions, by F. A. Haasis (pp. 9, 10); Toxic Action of *Trichoderma* on *Rhizoctonia* and Other Soil Fungi, by C. M. Haenseler and M. C. Allen (p. 10); Preliminary Note on the Relation of Mycorrhizae to Dry-Weight Increase in *Pinus strobus*, by A. B. Hatch (p. 10); Effect of Air Temperature on Tobacco Ring-Spot Infection (pp. 10, 11) and Experiments on the Control of Downy Mildew of Tobacco (p. 11), both by R. G. Henderson; The Origin of Roots Stimulated by Hairy-Root Bacteria in Apple Stems, by E. M. Hildebrand (p. 11); Masked Strain of Tobacco-Mosaic Virus, by F. O. Holmes (pp. 11, 12); Zinc Oxide As A Seed and Soil Treatment for Damping Off, by J. G. Horsfall (p. 12); Correlation Between Rough-Hairy Pubescence in Soybeans and Freedom from Injury by *Empoasca fabae*, by E. A. Hollowell and H. W. Johnson (p. 12); Partial Recovery and Immunity of Virus-Diseased Abutilon, by J. Y. Keur (pp. 12, 13); Tobacco and Aucuba-Mosaic Infections by Single Units of Virus, by L. O. Kunkel (p. 13); Experimental Production of Crown Gall on *Opuntia*, by M. Levine (p. 13); the Production of an Apparently New Variety of *Puccinia graminis* by Hybridization on Barberry, by M. N.

Levine, R. U. Cotter, and E. C. Stakman (pp. 13, 14); Nutritional Relationship in the Apple-Rust Fungus, by J. C. Liu (p. 14); Inheritance of Resistance to Powdery Mildew, *Erysiphe graminis tritici*, in Wheat, by E. B. Mains (p. 14); Relative Infectivity of Mosaic Virus Extracted from Various Parts of Sugarcane, by J. Matz (pp. 14, 15); Susceptibility of Treated and Untreated Turf to Brownpatch and Dollarspot, by H. F. A. North and L. E. Erwin (p. 15); Incubation Period of Pea Mosaic in *Macrosiphum pisi*, H. T. Osborn (p. 15); Rosette of Blackberries and Dewberries, by A. G. Plakidas (pp. 15, 16); Sweetpotato Ring Rot Caused by *Pythium ultimum*, by R. F. Poole (p. 16); Apple Target Canker, Measles, and Rough Bark, by J. W. Roberts (p. 16); Studies on Barley Smut in 1933, by M. L. Ruttle (Mrs. Nebel) (pp. 16, 17); Components of Potato Mild Mosaic, by E. S. Schultz, R. Bonde, and W. P. Raleigh (p. 17); *Intercellular Relative Humidity in Relation to Fire-Blight Resistance in Apple* and Pear, by L. Shaw (p. 17); Persistence of Heart-Rotting Fungi in Girdled Trees, by P. Spaulding (pp. 17, 18); The Pathogenicity and Cytology of *Urocystis occulta*, by E. C. Stakman, M. B. Moore, and R. C. Cassell (p. 18); The Action of Trypsin on Tobacco-Mosaic Virus, by W. M. Stanley (p. 18); Longevity of Sclerotia of *Phymatotrichum omnivorum* in Moist Soil in the Laboratory (pp. 18, 19) and Two New Diseases of the Texas Bluebell, *Eustoma russellianum* (p. 19), both by J. J. Taubenhaus and W. N. Ezekiel; Further Studies on A Noninfectious Leaf-Deforming Principle from Mosaic Tomato Plants, by M. H. Thornton and H. R. Kraybill (p. 19); Susceptibility Reactions of *Pinus sylvestris* to Woodgate Rust, by R. P. True (pp. 19, 20); Purification of the Virus of Tobacco Mosaic, by C. G. Vinson (p. 20); The Stimulation of Fungus Spore Germination by Aqueous Plant Extracts, by F. Wilcoxon and S. E. A. McCallan (p. 20): The Diurnal Cycle of *Erysiphe polygoni*, by C. E. Yarwood (pp. 20, 21); and Sclerotium Blight Destroys Winter Wheat in Gallatin County, Montana, by P. A. Young (p. 21).

The Plant Disease Reporter, February 1, March 15, April 1, May 1, June 1, and June 15, 1934 (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 18 (1934), Nos. 1, pp. 1–6; 2, pp. 7–22; 3, pp. 23–33, fig. 1; 4, pp. 34–43; 5, pp. 44–53; 6, pp. 54–73*).—Among other items of current interest, these issues contain the following notes:

No. 1.—An outbreak of *Bacillus amylovorus* in Saskatchewan, Canada; cranberry false blossom found in Nova Scotia; nut tree diseases in Oregon; pyrethrum, a new host for *Phymatotrichum* root rot, by J. J. Taubenhaus and H. B. Parks; diseases of ornamentals (*Pythium* associated with crysanthemum root rot, leaf disease of *Crassula*, and leaf spot of tuberose); first report of tobacco mildew; and keeping quality of the Massachusetts cranberry crop of 1933.

No. 2.—Records of agricultural projects known to have failed through plant diseases; cold weather injury to crops; downy mildew of spinach in Arkansas; new hosts for charcoal rot (*Rhizoctonia bataticola*) in California (*Phaseolus vulgaris, Vigna sinensis, P. coccineus, P. lunatus sieva, Sesamum orientale, Soja max, Lupinus mutabilis*, and *P. lunatus macrocarpa*); iris flower spot (*Gloeosporium cingulatum*); and *Nectria* canker on hardwoods in northeastern United States, by D. S. Welch.

No. 3.—Further notes on crop failures due to diseases, by H. W. Anderson; observations on diseases of Gramineae in Oregon and adjacent parts of Washington during the open winter of 1933–34, by R. Sprague; English form of tomato spotted wilt found in Oregon greenhouse, by F. P. McWhorter (on plants grown from seed imported directly from England); notes on variegated leaf troubles of strawberries, by G. M. Darrow; early records of cranberry false

blossom; early reports on apple scab (*Venturia inaequalis*) (reporting delayed maturing of perithecia in New York and Illinois in 1934); and downy mildew of tobacco in 1934.

No. 4.—Winter injury of fruit crops in Maine, Massachusetts, New York, New Jersey, Pennsylvania, and Kentucky; development of apple scab (*V. inaequalis*) in Massachusetts, New York, Michigan, and Kentucky; crop failure due to disease (*Septoria* on raspberry responsible for winter killing in Kentucky); market pathology notes from Chicago; notes on the reappearance of leaf variegation in the Blakemore strawberry; diseases noted at the Northwest Florists' Convention, by L. K. Jones; and remarks concerning the inspection of narcissus plantations for nematode infestation, by R. J. Hastings and J. E. Bosher.

No. 5.—Winter injury on ornamental plants in New Jersey, by R. P. White; *Aphelenchoides fragariae* on Cape Cod strawberries, by J. R. Christie and O. C. Boyd; leaf variegation of the Blakemore strawberry in Louisiana, by A. G. Plakidas; notes on apple scab (*V. inaequalis*) (from Maine, New York, Michigan, and Wisconsin); reports on vegetable diseases (gray mold rot of potato in Maine, additional note on the English form of tomato spotted wilt in Oregon, downy mildew (*Peronospora effusa*) of spinach in Virginia, and seed-borne pepper mosaic in Virginia); tobacco diseases (downy mildew and wildfire); rust of wheat and oats (in Texas), by C. H. Rogers; Dutch elm disease; and new narcissus *Botrytis* disease in the Pacific Northwest (*B. polyblastis*), by F. P. McWhorter and H. J. Reynolds.

No. 6.—The rusts of Mississippi (listing 622 collections representing 29 genera and 174 species), by L. E. Miles.

[Plant disease research at the Arkansas Station] (*Arkansas Sta. Bul. 297 (1934), pp. 33–37, 48, 51, 73–75, 88, 89, 94, 95, 100*).—A brief résumé is given of the results of investigations since the establishment of the station on cotton angular leaf spot and cotton wilt; bacterial stalk rot of corn; oat smut and a bacterial disease of grasses; stem rot, *Helminthosporium* leaf spot, seedling blight, and straighthead of rice; fire blight disease of fruit trees; control of grape diseases; and mosaic disease of sweetpotato.

[Contributions on plant diseases and their control in Florida] (In *Fla. State Hort. Soc. Proc., 44 (1931), pp. 99–104, 144–146, 180–182, 198–200; 45 (1932), pp. 42–45, 103–111; 46 (1933), pp. 76–79, 87–91*).—The proceedings for 1931 include the following papers: Rots of Florida Citrus Fruits, by H. E. Stevens and H. R. Fulton (pp. 99–104), discussing *Penicillium* rots and *Diplodia* and *Phomopsis* stem-end rots; Diseases of Subtropical Fruits, by H. E. Stevens (pp. 144–146), dealing with avocado scab, blotch, and black spot and mango anthracnose bloom blight; Plant Quarantines, by J. C. Goodwin (pp. 180–182); and Fungus Diseases of the Satsuma and Their Control, by E. F. DeBusk (pp. 198–200), discussing citrus scab and blue mold decay. Those for 1932 include: The Diseases of Ornamental Plants, by W. P. Shippy (pp. 42–45), and Clitocybe Mushroom Root-Rot—A New Citrus Root Disease Unmasked, by A. S. Rhoads (pp. 103–111), presenting an extensive discussion of the occurrence, symptoms, host plants, causal organism, and control practices. Those for 1933 include: Are Plant Quarantines Worth While? by B. L. Hammer (pp. 76–79); and Melanose and Stem-end Rots of Citrus Trees, by W. A. Kuntz and G. D. Ruehle (pp. 87–91).

[Botany and plant pathology] (*Iowa Sta. Rpt. 1933, pp. 44–53, 54–57, figs. 2*).—Brief reports are given of results on the following projects: Inheritance of resistance to *Basisporium* ear rot and seed rotting, and the relation of these characters to yield, by C. S. Reddy and E. W. Lindstrom; biology and control of *Colletotrichum lagenarium* on species of Cucurbitaceae, by D. V. Layton;

breeding and selection of better resistant strains of melons, by J. J. Wilson; physiological specialization and parasitism of crown rust of oats, and the making of new strains of oats resistant to crown rust by selection and hybridization, both by H. C. Murphy; control of seed- and soil-borne diseases of the potato, by Reddy; pathogenicity, host response, and control of leaf spot of sugar beets, and breeding of sugar beet strains resistant to *Cercospora* leaf spot, host range, and intertransmissibility of species of *Cercospora*, both by S. M. Dietz; diseases of the sugar beet caused by species of *Phoma*, *Rhizoctonia*, *Pythium*, etc., in their relation to the *Cercospora* leaf spot disease, and development and testing of dust fungicides for control of seed-borne diseases of wheat and oats, both by Reddy; classification of viruses infecting cucumbers, by R. H. Porter; propagation of disease-free sweetpotato seed stock, by Layton; the pathogenicity and morphology of the genus *Gymnosporangium* in Iowa, and the control of nursery diseases (cherry yellow-leaf, damping-off of evergreen seedlings, *Phomopsis* blight of red cedar, leaf spot of phlox, leaf spot and scab of apple, and hollyhock anthracnose), both by G. L. McNew; relation of fungi to respiration and fermentation occurring in stored hay, by A. L. Bakke and E. R. Henson; a survey and identification of the fungi occurring on cornstalks and their effect singly and in combinations on cornstalk tissues, by J. C. Gilman; seed investigations with barley, sweet corn, and bluegrass, by Porter, E. O. Brown, and C. M. King; morphology and cytology of wilt-resistant strains and varieties of melons, by L. M. Weetman; a study of the yellow dwarf and other onion diseases in Iowa, by I. E. Melhus and W. J. Henderson; factors influencing resistance of strains of corn to *Ustilago zeae*, by Melhus and G. N. Davis; *Diplodia* dry rot of corn, by Melhus; physiological response of the growing plant and the pathogene to chemical treatments of seed corn, and pathogenicity of *Basisporium gallarum* to corn, both by Reddy; and an investigation of varietal response in flax, by Reddy and L. C. Burnett.

Plant pathology (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 22–24*).—Data are briefly reported on sugarcane diseases, dewberry and blackberry rosette, strawberry disease investigations, and tomato wilt.

[Plant disease investigations in Maine] (*Maine Sta. Bul. 369 (1933), pp. 555–557, 558–581, figs. 3*).—Reports are given on the following lines of work pursued in 1933 with potatoes: Aroostook County potato seed plats and mosaic, by G. W. Simpson; tuber lines free from latent mosaic, by W. P. Raleigh; effect of virus diseases on yield, by E. S. Schultz, R. Bonde, and Raleigh; resistance to virus diseases, by Schultz, F. J. Stevenson, C. F. Clark, Bonde, and Raleigh; seed plats in northeastern Maine, by Schultz, Bonde, and Raleigh, and in southwestern Maine, by D. Folsom; natural dissemination of virus diseases in northeastern Maine, by Bonde; components of potato mild mosaic, by Schultz, Bonde, and Raleigh; effect of potato sport and place of growth and storage on yield of tuber line and potato rots in tuber-bruising studies, both by Folsom; resistance of seedlings to late blight, by Stevenson, Schultz, Clark, Bonde, and Raleigh; yield comparisons between Green Mountain, Giant Hill, and Foster Seedling or Rust Proof potatoes, by Bonde; soil disinfection for potatoes against *Rhizoctonia*, by Folsom; spraying and dusting (including the value of spraying in the absence of late blight or potato rust, the delayed spray program, spray service, effect of decreasing the lime in the Bordeaux mixture formula, high-magnesium lime v. high-calcium lime in the preparation of Bordeaux mixture, comparison of Bordeaux mixture and home-made colloidal copper spray, comparison of home-mixed and commercially prepared copper-lime dusts, comparison of Bordeaux mixture and home-mixed dust, and comparison between plats dusted with home-mixed dust and nonsprayed controls,

all by Bonde; seed-potato treatment, by Raleigh and Bonde; and common scab of potato, by Raleigh. Apple scab control, by Folsom, and blueberry diseases (including effects of witches'-broom, fungicidal treatments to control foliage diseases, and the relationship between leaves, berries, and fruit buds) and corn wilt, both by F. L. Markin, are also reported upon.

[Plant diseases and their control in Massachusetts] (*Massachusetts Sta. Bul. 305 (1934), pp. 14, 15, 17–21, 48*).—Brief reports on 1933 results are given for the following investigations: Black root rot (of tobacco), by C. V. Kightlinger; black root rot of tobacco, brown root rot of tobacco, and downy mildews of cucumber and lettuce, all by W. L. Doran; control of greenhouse tomato diseases, by E. F. Guba; eradication of nematodes in greenhouse soils by the use of orthodichlorobenzene, by L. H. Jones; vegetable seed treatments, causes and control of decay of winter squash in storage, and strawberry gold leaf, all by Guba; diseases of herbaceous ornamental plants caused by soil-infesting fungi, by Doran; carnation blight, by Guba; and cooperative investigations on HCN injury following copper in greenhouses and "dark center" of turnips, by E. B. Holland.

[Plant pathological investigations in New Hampshire] (*New Hampshire Sta. Bul. 280 (1934), pp. 19, 20, 21*).—Brief reports are given on lines of work pursued in 1933 under the following headings: Burgundy not always a substitute for Bordeaux; lime-sulfur apple scab spray injury; results on apple scab sprays repeated; and crop size and harvest date influence bitter pit.

[Studies in phytopathology in India in 1932], M. J. Narasimhan (*Biochem. and Allied Res. India, 1932, pp. 47–54*).—This review of published research in India (1932) includes the green ear disease (*Sclerospora graminicola*) of bajra; a morphological study of the downy mildew (*S. graminicola* var. *Andropogonis sorghi*) on sorghum and maize; *S. sorghi;* physiologic forms in *S. graminicola;* top rot (*Phytophthora palmivora*) of areca trees; *P. palmivora* on a hitherto undescribed host (*Aleurites fordi*, tung-oil tree); mode of penetration of the cotton wilt fungus; foot rot and "black point" disease of wheat; virus diseases of zinnias; sandal spike disease; *Rhizoctonia bataticola* on sorghum; wilt resistance of pigeonpeas; sugarcane mosaic; diseases of gram; *Phytophthora* diseases; diseases of coffee; and studies of the fungus flora of India.

Adhesiveness of dusts, I, II [trans. title], M. S. Dounine and A. M. Simsky (*Angew. Bot., 14 (1932), No. 1, pp. 33–78*).—An extensive investigation is reported in two communications on the adhesiveness of sodium arsenite, calcium arsenite, calcium dichromate, paris green, copper carbonate, and malachite dusts on the seeds of wheat, oats, hemp, flax millet, and *Hibiscus cannabinus*. The method of G. Hilgendorff or modifications of it was used for the most part. Adhesiveness was greatest with the dusts of lower specific gravity. After passage through sieves adherence was increased 15 percent in the case of 3,600 meshes per square centimeter, and 30 percent after 6,400 meshes. Increasing the dose of the fungicide resulted in less difference in the relative adhesiveness of the different sized particles. Adherence varied for each kind of seed in the case of the different dusts. The most adhesive dusts, paris green and sodium arsenite, adhered the best when the apparatus for mixing dust and seed was set at 30–60 r.p.m. Higher speeds caused a decrease in adherence. The duration of mixing for the maximum adhesiveness varied from 10 to 70 min., the less adhesive dusts requiring the longer time. An increase in the moisture content of the seed resulted in greater adherence of hygroscopic dusts.

The presence of weed seeds caused a decrease in the adherence of the dusts to the good seeds. The addition of different soil dusts to the fugicidal dusts brought about a definite decrease in the adherence of the latter to the seeds. The addition of various inert fillers (chalk, talc, dextrin, pulverized charcoal, etc.) to the fungicides lowered their adhesiveness. The greater the contamination of wheat by bunt, the greater the adherence of calcium arsenite, copper carbonate, and paris green.—(*Courtesy Biol. Abs.*)

The adhesiveness of fungicides, III [trans. title], M. S. Dounine and A. M. Simsky (*Angew. Bot., 14 (1932), No. 2, pp. 89–110*).—The adherence of the dusts was better in the case of heavy seeds, as wheat and *Hibiscus cannabinus*, than in the case of light seeds. Storage of treated wheat and oats up to 3½ mo. did not lessen the adhesiveness of dusts. Treated seed, when passed through an "Elworti" sowing apparatus, lost 6 percent of the adhering dust. The dusts were not distributed uniformly over the seed. The largest part collected among the hairs (brush) and the glumes and in the groove. The adherence of the dust to the seed is believed to be conditioned by mechanical adhesion and molecular force.—(*Courtesy Biol. Abs.*)

Dusting miscellaneous seeds with red copper oxide to combat damping-off, J. G. Horsfall, A. G. Newhall, and C. E. F. Guterman (*New York State Sta. Bul. 643 (1934), pp. 39, figs. 7*).—This bulletin gives the results of a continuation of studies previously reported (E.S.R., 68, p. 627).

The range of possibility of the red copper oxide seed treatment for controlling damping-off caused mainly by *Pythium ultimum*, but to a lesser extent by *Rhizoctonia solani*, the injuriousness of the chemical, and the apparent stimulating effects were studied in the greenhouse and field on 107 species and varieties of plants. Damping-off control and injury by red copper oxide were largely specific for the plant, the fungus, and the conditions in question. Solanaceous plants, legumes, cucurbits, composites, spinach, and beets responded favorably to treatment. Crucifers, dianthus, asters, gaillardia, and hibiscus, among others, were likely to be injured. Lilium, allium, and corn were neither benefited nor greatly injured. Injury was more apt to occur in the absence of soil organic matter or with insufficient soil moisture. Presoaking of certain seeds prior to treatment may also be favorable to injury.

In small dosages, red copper oxide sometimes accelerated emergence, as well as elongation, and deepened the color of such plants as cucurbits, peas, tomatoes, helichrysum, cosmos, and others. This may have been due merely to protection against root disease. The optimum dosage for spinach is reported as about 2.5 percent of dust by weight, for beets 6 percent, but for cucurbits, peas, etc., about 0.25 to 0.5 percent. The specifications for red copper oxide as a fungicide are fairly well defined, but they were not yet being met by all manufacturers and jobbers. It is stated that the dust should be bright brick-red in color and not darkened on standing, should adhere strongly to white paper, should float in the air like smoke when shaken in a vial, and should pass through a 325-mesh screen.

Studies on barley smuts and on loose smut of wheat, M. L. Ruttle (Mrs. Nebel) (*New York State Sta. Tech. Bul. 221 (1934), pp. 39, figs. 6*).—The morphology, types of spore germination, modes of infection, and host relations were studied for a number of collections of barley smut obtained at Geneva or received from other parts of the United States and Canada. In addition to the typical loose smut (*Ustilago nuda*) and covered smut (*U. hordei*) the author found 5 distinct intermediate types, 1 of which corresponded closely to *U. medians* which is regarded as a probable synonym of *U. nigra*. Each of these 5 is described, and a chart compares all the types as to the appearance

of the attacked head, the color and compactness of the spore mass, the character of the spore wall, and the type of spore germination. Of the 7 barley smut types studied, only 2 were smooth-spored, and only 2 germinated by germ tubes rather than by forming sporidia. These were both rough-spored. Several of the types displaying a "loose" smut appearance produce sporidia and are probably controllable by seed treatment.

Blossom infection studies were conducted with Alpha, Featherstone, and Tennessee Winter barleys and Reward and Honor wheats, and in addition to the barley smut types employed, two collections of loose smut of wheat (*U. tritici*) were used. Barley varieties were also seed inoculated by several methods. No type of barley smut used attacked Reward wheat. Loose smut of wheat (Reward form) did not attack barley. *U. tritici*, from Honor wheat, did not attack Reward wheat, and vice versa.

The chlamydospores resulting from inoculations with a single strain of barley smut were not necessarily uniform as to wall characters. When spores of *U. hordei* were applied to seed which had previously been flower inoculated with *U. nuda*, some of the plants appeared to be affected with one or the other type of smut only. In some instances, however, both types were found in the same plant. In a few instances an intermediate or suspected hybrid type of smut was met with. The existence of some biological specialization within the types of barley smut studied is indicated by the inoculation results with different barley varieties.

Monosporidial cultures from 2 barley smut types were obtained by the use of an ingenious micromanipulator, which is described. Fusions between sporidia taken from these cultures indicate the existence of two sex groups. Mixed monosporidial plus and minus cultures of the same smut type resulted in successful infection, which was not obtained with either alone.

In one of the forms studied, blossom infection did not result in seed penetration, but the fungus developed resting sporidia and hyphae on the surface of the caryopsis. These produced active sporidia within a day after the seed had been put to germinate, resulting in successful invasion of the plant. Mycelial invasion of the seed, however, was abundant in the case of typical *U. nuda* and *U. tritici*.

Physiologic specialization and variation in Helminthosporium gramineum Rab., J. J. CHRISTENSEN and T. W. GRAHAM (*Minnesota Sta. Tech. Bul. 95 (1934), pp. 40, figs. 17*).—In order to find out how extensively the barley stripe disease fungus might vary in morphological and pathogenic characteristics, approximately 1,200 monosporous isolates were made from material obtained from 12 States of the United States and from Canada and Germany. Several hundred of these were studied in considerable detail.

The results indicated that *H. gramineum* comprises an indefinite number of races which differ from one another in many characters. More than 125 races were definitely distinguishable by their cultural characteristics. The type of medium had a profound effect on cultural characteristics of *H. gramineum*. Races did not all respond alike. Two races might be similar on one medium but entirely different on another.

The association of *H. gramineum* with certain bacteria in culture affected some races differently. It stimulated or even induced pigment production in certain races, but not in others. Staling products of these bacteria exerted differential effects on mycelial development among races. Races of *H. gramineum* also varied in their tolerance to ultraviolet light. This treatment failed to stimulate fructification or to induce production of variants. Some races of *H. gramineum* were stable, and others were very unstable. New races arose

frequently in culture either from sectors or from "patch" variants. Some of them remained constant through several mycelial transfers, others produced new variants. The results of monosporous reisolation after passing a race back to the host indicated that certain races may give rise to variants while on the living host. Thus the conidial progeny obtained from a barley plant inoculated with a single race fell into 10 distinct cultural groups.

The morphology of the conidia may be an additional aid in distinguishing races of *H. gramineum*. There were statistically significant differences in measurements in length, width, and number of septa of conidia between races.

At least 20 races, and possibly more, could be distinguished by their relative virulence on 16 varieties of barley. There were profound differences between races in parasitism. Some races were extremely virulent, others moderately so, and still others were only weakly parasitic. A race, however, might attack certain varieties heavily and others weakly, or vice versa. Whenever varieties of barley were inoculated with a combination of races possessing different virulence, the reaction usually corresponded to averages obtained by inoculation of the races singly. In general, Svansota, Manchuria, Minsturdi, Peatland, and Velvet were the most susceptible varieties and were attacked most severely by the largest number of races. No variety, however, was completely susceptible to all of the races. Lion, Glabron, and Wisconsin No. 38 were moderately resistant, while Black Hull-less, Spartan, and Trebi were among the most resistant ones tested.

As there are numerous parasitic races of *H. gramineum*, considerable caution is necessary in drawing final conclusions regarding resistance from results on varietal tests with a limited number of races of the parasite.

Hot-water treatment of seed barley: Crop results in Canterbury, seasons 1930 to 1933, C. H. and J. H. Hewlett (*New Zeal. Jour. Agr., 47 (1933), No. 1, pp. 33–37*).—Barley grades resulting from the use of seed that had been hot-water treated by a commercial seed company in 1933 are reported for 179 farms in comparison with the grades from 26 farms where growers used their own seed. The percentage of No. 1 grade for the former was 38.9 as compared with 26.6 for the latter. The general average yield from owners' seed was 5.2 bu. per acre less than that from treated seed.

Field studies on resistance of hybrid selections of oats to covered and loose smuts, T. R. Stanton, F. A. Coffman, and V. F. Tapke (*U.S. Dept. Agr., Tech. Bul. 422 (1934), pp. 10*).—This bulletin reports the results of tests conducted by the U.S. Department of Agriculture in cooperation with the Iowa, North Dakota, Montana, Idaho, and Oregon Experiment Stations from 1925 to 1927, inclusive. In an effort to reduce losses from oat smuts in the United States, estimated at approximately 45,000,000 bu. annually, by the development of commercially desirable varieties of oats resistant to smut and adapted to growth in different regions, crosses were made between Markton, a variety which has proved nearly immune to both covered and loose smuts (*Ustilago levis* and *U. avenae*), and Idamine, Victory, Iogren, Silvermine, Swedish Select, Scottish Chief, Early Champion, and Ligowa. These latter have high commercial value, but tests showed them to be susceptible to both species of smut.

Seed obtained from these crosses and from succeeding inbred selections was dehulled, coated with mixed chlamydospores of loose and covered smut thought to represent the common physiologic forms occurring in the Northern States, and planted under a wide range of environmental conditions at stations in the arid, semiarid, and humid sections of the country for one or more years. The susceptible hybrids were weeded out in each successive generation. In some cases, however, smutted plants still appeared in the F_6.

Promising hybrids were obtained from the various crosses which combine the near immunity of Markton with the other desirable characters of the susceptible parent. Incidentally, out of 200 selections from the unnamed strain of oats (C.I. No. 357) from which Markton originated, 156 became smutted in a 2-year test, but numerous highly resistant lines were isolated similar to Markton in plant and kernel characters, although there was no correlation between the Markton form and smut resistance.

The relation of certain morphological characters of the host and fungus to the identification of the loose and covered smuts of oats, E. L. KINGSLEY (*Kans. Acad. Sci. Trans., 36 (1933), pp. 98–104*).—A very thin whitish membrane over the spore masses is almost always present in *Ustilago levis* and absent in *U. avenae*, but examination of the chlamydospores under high magnification is necessary for certain separation.—(*Courtesy Biol. Abs.*)

Possible coexistence of loose smut and bunt on the same wheat plant [trans. title], O. MUNERATI (*Italia Agr., 70 (1933), No. 6, pp. 631–635, figs. 3*).—Observations were made on Gentil Rosso wheat attacked simultaneously by *Ustilago tritici* and *Tilletia tritici*. *Ustilago* usually precedes *Tilletia*. When the two fungi are present together the loose smut is confined to the external tissues, bunt destroying the interior of the grains.—(*Courtesy Biol. Abs.*)

Studies on foot and root rot of wheat, III, IV, W. C. BROADFOOT (*Canad. Jour. Res., 10 (1934), No. 1, pp. 95–114, figs. 2; 115–124*).—The author continues studies previously noted (E.S.R., 69, p. 811).

III. *Effect of crop rotation and cultural practice on the development of foot rot of wheat.*—A uniform cooperative crop sequence study at 7 stations in western Canada (Morden, Indian Head, Swift Current, Scott, Lethbridge, Olds, and Vermilion) from 1928 to 1932, inclusive, indicated that foot rot damage of wheat is significantly reduced where wheat alternates with summer fallow in a 2-year rotation; where it follows summer fallow in other rotations; alternates with oats in a 2-year rotation; follows oats in a 3-year rotation; follows sweetclover in a 3-year rotation; or where wheat is sown late. It is increased where wheat follows wheat, barley, or western ryegrass.

IV. *Effect of crop rotation and cultural practice on the relative prevalence of Helminthosporium sativum and Fusarium spp. as indicated by isolations from wheat plants.*—The crown and root tissue from 43,305 of 47,360 plants examined yielded *H. sativum*, *F. culmorum*, and other *Fusarium* species, either alone or in combination with these or other fungi and bacteria. It was the exception for any mature plant, the surface tissue of which was disinfected, to be free from fungi or bacteria. None of the various crop sequences or cultural practices used in this study appeared to significantly affect more than another the relative prevalence of either *H. sativum* or *Fusarium* spp., as indicated by isolations from the crown tissue of wheat. However, as there was a marked tendency at certain stations each year for *H. sativum* or *Fusarium* spp. to predominate, it was concluded that certain factors of the environment were more effective than the crop sequence in modifying the relative prevalence of the two fungi mentioned in the crown and root tissue of wheat plants.

The problem of clubroot of crucifers [trans. title], K. FLACHS and M. KRONBERGER (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz, 8 (1930), Nos. 4, pp. 75–80; 5, pp. 106–115, figs. 6*).—Tabulated results of field trials with cauliflower indicate that damage from clubroot may be satisfactorily reduced by the use either of quicklime or of a fungicide like formalin or organic mercurials applied to the soil. Dipping the roots into an unnamed disinfectant in one case also markedly suppressed attack.

In investigating whether the microbiological nature of the soils in question has any connection with the occurrence of clubroot, the authors concluded that

overmanuring with barnyard manure upsets the soil-flora equilibrium, that the resulting development of H_2S damages the nitrogen-fixing power of free living organisms (especially *Azotobacter*), and that, since H_2S brings about a weakening of the decomposition process, the appearance of clubroot and probably other plant parasites also is favored.

Effect of temperature and moisture on occurrence of brownpatch, A. S. DAHL (*Bul. U.S. Golf Assoc. Green Sect., 13 (1933), No. 3, pp. 53–61, fig. 1*).—Brownpatch caused by *Rhizoctonia solani* is shown to be influenced by temperature and moisture to a marked degree. When the maximum temperature is above 90° F., there is a chance that brownpatch will occur about 74 percent of the time. The fungus does not grow well above 100°, and brown patch rarely occurs when the maximum temperature is below 75°. Data indicate that when the minimum temperature was above 70° brownpatch occurred 82 percent of the time, but when it was below 60° the disease occurred only 27 percent of the time. While the fungus is more active at the higher temperatures, there is no definite point above which it occurs and below which it occurs. Indications are that other factors are also important in the occurrence of this disease.

Although moisture is one of the factors which influence the occurrence of the disease, the methods for measuring and recording the moisture relationship are imperfect, and for that reason definite correlations are not possible. An analysis of the moisture records taken at the Arlington turf garden [Arlington, Va.] shows that it is not possible to predict the occurrence of the disease by these records, as the amount of moisture in the air and the rate of evaporation are factors which have to be considered. The disease may thus occur when one factor is favorable and the other unfavorable, so that it is practically impossible to determine which factor is more responsible for the encouragement of the attack of the fungus.—(*Courtesy Biol. Abs.*)

Effect of watering putting greens on occurrence of brownpatch, A. S. DAHL (*Bul. U.S. Golf Assoc. Green Sect., 13 (1933), No. 3, pp. 62–66*).—There is a wide difference of opinion as to the amount of water necessary to keep turf in the best growing condition. Much depends upon the environment and the variety of grass that is used, but it is generally possible to determine whether a green has too much or too little water at any time during a season. It has been commonly observed that brownpatch is more prevalent when greens are soaked with water. The studies considered the amounts of water used on putting greens, and the methods of watering and the amounts applied are discussed. When greens were heavily watered there was approximately the same amount of disease on both morning- and evening-watered areas. The areas which were lightly watered, however, demonstrated that the morning watering materially reduced the amount of disease. The studies indicate that the amount of water and time of watering of the green influenced the frequency and severity of the disease.

It is thought that careful use of water will diminish the amount of brownpatch.—(*Courtesy Biol. Abs.*)

New mosaic-resistant Refugee bean is developed, W. A. PIERCE and J. C. WALKER (*Canning Age, 15 (1934), No. 2, pp. 83, 84*).—The Corbett Refugee bean was developed from a single mosaic-resistant plant found in a field of severely attacked beans in 1929. The variety was thoroughly tested by the authors by inoculation with the virus and found completely resistant. Since it has certain undesirable features from a canning standpoint it was crossed with Refugee Green. Several resistant selected lines were developed, and two strains differing primarily from Refugee Green in resistance to common bean mosaic are reported ready for distribution to seedsmen under the names Idaho

Refugee and Wisconsin Refugee. In canning tests they scored as high as, or higher than, Refugee Green.

Uniformity in pathogenicity and cultural behavior among strains of the cabbage-yellows organism, L. M. Blank (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 5, pp. 401–409*).—Nineteen isolates of *Fusarium conglutinans* from 11 States were studied regarding comparative pathogenicity and cultural behavior. Cultural studies failed to bring out significant differences. Sectoring was observed in only one of the hyphal tip lines of 1 of the isolates. Homozygous susceptible lines of cabbage were uniformly attacked by all except 2 of the isolates which were less virulent. All isolates were alike in their inability to attack successfully homozygous resistant lines of cabbage at 24° C. In F_2 hybrid lines of resistant-susceptible crosses the percentage of plants that became dieased was close to the expected 25 percent. The isolates showed no selective pathogenicity upon 6 subspecies of *Brassica oleracea* studied.

Pink root and bulb rot of onions, S. J. du Plessis (*Farming in So. Africa, 9* (*1934*), *No. 95, p. 70*).—This disease may cause a 20 to 30 percent loss and even 50 percent or more when accompanied by white mold disease. Two fungi have been found to cause pink root—*Fusarium cepae*, which also may cause soft, watery bulb rot in the field or storeroom, and *Phoma terrestris*, which, as far as has been ascertained, causes pink root only, and more readily than the *Fusarium*.

Susceptibility to the *Fusarium* of a number of early as well as late commercial onion varieties was tested. None were resistant. Garlic, leek, and shallots were also susceptible.

Onions at 25° C. (77° F.) are more vigorously attacked than those at 30°. The disease is more prevalent on dry than on moist soil. On soils deficient in nitrogen application of nitrogenous fertilizer not only increased the yield but greatly reduced the percentage of infection. Potash had a similar but less marked effect. Phosphates had little effect on yield or percentage of infection. *F. cepae* apparently can live in the soil for an unlimited period.

Disinfection of seed and seed beds is recommended. The most satisfactory method of control in seed bed soil was to burn straw or shrubs on the soil for 45 min. Irrigation and application of fertilizers counteracted much of the losses. A 2-year rotation is suggested.

What root-rot does to the quality of peas, Z. I. Kertesz and J. G. Horsfall (*New York State Sta. Circ. 141* (*1934*), *pp. 3, fig. 1*).—This is a nontechnical discussion of the pea root rot problem as affecting the canning crop. Suggestions for reducing the losses include the use of a long rotation (5 yr.), avoidance of pea vines for top dressing soil, the use of wilt-resistant varieties where wilt is troublesome, the use of well-drained soil, avoidance of soil packing, the use of fall plowing, and separate harvesting of peas from root rot spots in a field.

Fusarium-rot in potatoes, B. J. Dippenaar (*Farming in So. Africa, 9* (*1934*), *No. 95, p. 58, figs. 2*).—The incidence in the Union of South Africa of the *Fusarium* spp. causing potato dry rots is not known. It has been definitely ascertained that *F. bulbigenum*, *F. orthoceras*, *F. oxysporum*, and *F. coeruleum* are among those causing *Fusarium* rot in the winter rainfall area of the western Cape Province, but it has not been proved that any of them can also cause wilt in potatoes in the field. A general account is included of losses, symptoms, environmental conditions favoring development, and control.

The physiology of potato leaf-roll.—I, On the respiration of healthy and leaf-roll infected potatoes, T. Whitehead (*Ann. Appl. Biol., 21* (*1934*), *No. 1, pp. 48–77, figs. 20*).—"A comparative study of the rates of respiration, as measured by the weight of carbon dioxide evolved, has been made with healthy

and leaf-roll infected potatoes at all stages in the life cycle, under anaerobic as well as aerobic conditions. Except for a short period covering the end of dormancy of the tuber to the first unfolding of the leaves, the infected plant respires at a much higher rate than does the healthy one. This is true also when the conditions of light, temperature, and external carbon dioxide approximate to those present in the field. The rate of respiration is not directly related to the presence of the virus but rather to the available amount of respirable substrate. Normally the accumulation of such substances in the leaves of leaf-roll plants occurs at a very early stage of development but can be delayed by continuous exposure to light of low intensities. Under these latter conditions the rate of respiration of diseased plants approximates to that of healthy ones."

Potato virus diseases in 1932, D. FOLSOM (*Amer. Potato Jour., 10 (1933), No. 11, pp. 224–233; abs. in Maine Sta. Bul. 369 (1933), p. 588*).—In this contribution from the Maine Experiment Station, the author cites and reviews over 100 contributions to the literature on virus diseases of the potato appearing in various publications throughout the world during 1932. The article is a brief, condensed summary organized under the following headings: Spindle tuber and leaf roll; mosaics and calico; masked mosaics; dissemination; control; identification, nomenclature, and classification; environment and chemical composition; degeneration; nature of a virus; comparative pathology; general papers; and miscellaneous.

A second anthracnose of tobacco caused by a species of Gloeosporium [trans. title], K. BÖNING (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz, 10 (1933), No. 11, pp. 253–255, fig. 1*).—In Königsberg, Germany, *Nicotiana rustica* was found attacked by a leaf disease similar to that produced by *Colletotrichum tabacum*. Isolation, cultivation, and inoculation proved it to be a true parasite, which is described and tentatively named *G. tabacum*.

Barn spot of tobacco.—Preliminary investigations and flue-curing experiments, L. F. MANDELSON (*Queensland Agr. Jour., 41 (1934), No. 2, pp. 132–147, figs. 5*).—Barn spot of tobacco is caused by *Cercospora nicotianae* and develops during the curing process. When tobacco leaf was heated to about 130° F. development of barn spot was controlled to some extent, but the danger of ruining the leaf by overheating was too great to warrant recommendations of this procedure.

The nature of the growth of *C. nicotianae* varies considerably when grown on artificial media at different temperatures. The optimum temperature for growth on potato dextrose agar was approximately 26° C. (78.8° F.). The minimum and maximum temperatures for growth were 7.5° and 34°, respectively. Since barn spot may develop during the curing process at temperatures greater than 93° F., it is considered likely that barn spot is not the result of growth of *C. nicotianae* during curing but is due to the reaction at this time of cells which have been affected by the parasite in the field. The more mature the tobacco leaf tissue the more liable it was to the development of barn spot. Humidity studies indicated that the rate of development of the spots increased with increase in relative humidity up to 95 percent, beyond which the rate of growth dropped slightly.

Two flue-curing experiments were carried out with commercial curing barns. Maintaining high relative humidity with the facilities available was difficult. In both experiments the coloring process was considerably accelerated, and the leaf was not adversely affected by the increase in humidity and temperature of the barns. In the second experiment the temperature in the experimental barn was 98° to 108° F., and the relative humidity of the atmosphere was either at or above 96 percent for 14 hr. during the first 24 hr. of curing, which was

higher in both respects than in the first barn. Leaf cured in this barn developed considerably less barn spot than similar leaf cured in the usual way.

The "kromnek" disease of tobacco (*Rhodesia Agr. Jour., 31 (1934), No. 1, pp. 9, 10*).—Attention is called to the recent appearance in Rhodesia of the virus disease known as "kromnek" or "Kat River wilt." Symptoms as they have appeared on flue-cured tobacco 1 mo. after planting are given. The disease in many respects resembles leaf curl. What is considered to be the same disease has been reported by E. S. Moore on tobacco and other hosts in the Union of South Africa.

The effect of mosaic disease upon certain metabolic products in the tobacco plant, H. Cordingley, J. Grainger, W. H. Pearsall, and A. Wright (*Ann. Appl. Biol., 21 (1934), No. 1, pp. 78–89*).—Chemical analyses of *Nicotiana tabacum*, with adequate control of sampling errors, showed that leaves of plants infected with mosaic disease contain higher proportions of protein and amino and soluble nitrogen and lower proportions of carbohydrate than healthy leaves. These differences are apparently increased during photosynthesis. In leaves kept in the dark for 68 hr. carbohydrate losses fall chiefly on insoluble carbohydrates in healthy leaves and on disaccharides in diseased leaves. In the latter, protein break-down is retarded and insoluble substances are less readily hydrolyzed. In these respects the diseased leaves resemble older leaves. The relation of the observed facts to growth metabolism in the diseased leaves is discussed.—(*Courtesy Biol. Abs.*)

Toxin produced by Bacterium tabacum and its relation to host range, E. E. Clayton (*Jour. Agr. Res. [U.S.], 48 (1934), No. 5, pp. 411–426, figs. 6*).—*B. tabacum* grown in pure culture secretes a toxin. This toxin readily passes through the ordinary filters, is not precipitated by alcohol, neutral calcium, or lead acetates, is not removed from solution by boiling with bone black, and is not affected by formaldehyde, mercuric chloride, or acids. It is, however, quickly inactivated by dilute alkalies. Leaves of many species of plants were wound inoculated by pricking with cultures containing both bacteria and toxin, and typical wildfire halo lesions were produced on most species. Judged by the size and character of the lesions, some species were much more susceptible to the disease than tobacco. Inoculations using the toxin alone gave similar results, but inoculations with the bacteria alone produced lesions only on tobacco. Notwithstanding the fact that the requirements of the Koch rules of proof could be complied with for many species, it is concluded that only species of *Nicotiana* should be regarded as host plants for *B. tabacum*. The reasons for coming to this conclusion were (1) the organism persisted but a short time in tissues other than tobacco, (2) the bacteria freed from the toxin produced lesions only on tobacco, and (3) under natural conditions tobacco was the only crop on which the disease occurred.

Diseases and insect pests of tobacco in Rumania, 1933 [trans. title], V. Ghimpu (*Bul. Cult. şi Ferment. Tutunului, 22 (1933), No. 4, pp. 396–401; Fr. abs., pp. 400, 401*).—The chief causes of damage to the 1933 tobacco crop in Rumania are listed as wind, frost, chloroses due to mineral deficiencies, mosaic, ring spot and vein banding viruses, wildfire, black root rot, powdery mildew, black shank, *Phyllosticta*, *Alternaria*, *Gryllotalpa vulgaris*, *Thrips tabaci*, and *Agrotis segetum*.

Developmental physiology of Cladosporium fulvum and the resistance of Solanum racemigerum to this parasite [trans. title], M. Schmidt (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 20 (1933), No. 3, pp. 407–439, figs. 21*).—The purpose of this study is an explanation of the previously discovered high resistance of *S. racemigerum* to the brown spot disease caused

by *C. fulvum*. Germination of spores was observed on solid and liquid media. In decoction of living leaves of the susceptible Bonnie Best tomato the germ tube and mycelium from spores were large, short, and warty compared with that on usual culture media. In an extended series of trials this character of germination was correlated with the presence of solanine in the plant species or part of the plant from which the decoction was made. It could also be produced by small amounts of commercial solanine in liquid media. With increased dilutions of these solanine-containing media the germ tube was more nearly like that formed in water. On the other hand the resistant *S. racemigerum* contained a germination-inhibiting principle, provisionally called "prohibitin", in addition to solanine. Solanine itself inhibits germination in high concentration, but it was not found in higher concentration in this species than in the susceptible tomato Bonnie Best. The germination-inhibiting principle is water soluble and is inactivated by heating the extracted sap from 20 to 30 min. at 100° C.—likewise by precipitating the extract with tannic acid.—(*Courtesy Biol. Abs.*)

Fusarium wilt in tomatoes, V. A. Wager (*Farming in So. Africa, 9 (1934), No. 95, pp. 61–63, figs. 5*).—In the Union of South Africa tomatoes are attacked by *F. bulbigenum* (*F. lycopersici*) wilt and bacterial wilt, which also occurs in potatoes. *Fusarium* wilt has so far appeared only in the lowveld of the eastern and northeastern Transvaal. Tests showed only occasional transmission of the *Fusarium* on the seed. A general account of the disease in the field, its symptoms, spread, and control are given. Four seasons' selection work has developed highly resistant strains of the Marvel and Stone varieties, which are proving satisfactory under field conditions.

Woodiness in tomato fruits.—Preliminary report [trans. title], V. Rischkow, J. Karatschevsky, and P. Michailona (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 43 (1933), No. 8–9, pp. 496–498*).—This undescribed disease, discovered in the Crimea, causes the fruits to become very hard and tasteless. It appears in mid-July and spreads rapidly up to mid-August. Only the young shoots take the disease. They become whitish-green, their development is checked, and the blades remain for a long time folded along the midrib The calyx lobes are abnormally long, the corolla is checked in its development, and some ovules become transformed into little green foliar proliferations. The similarity to a tobacco virus described by Ghmphi and Kostoff is mentioned. Diseased fruits have strongly developed vascular bundles with many wood fibers, while the fruit stems are thicker and woodier than normal. The stem is overcrowded with starch. The phloem is not necrotic but hypertrophied, as is the xylem.

Infection was accomplished by transplantation but not by inoculation with sap. Cicadas are suspected but not proved to be natural carriers. The disease is thought to belong to the "yellows" rather than to the "mosaic" group of viroses.

A study of some factors influencing germination of the spores of Phyllosticta solitaria, I. A. Burgert (*Kans. Acad. Sci. Trans., 36 (1933), p. 82*).—Bark decoction, especially of apple, acted favorably. There seems to be an interval between morphological and physiological maturity of spores formed in culture as well as in nature.—(*Courtesy Biol. Abs.*)

Pseudomonas rhizogenes R.B.W.K. & S.: Its host relations and characteristics, R. F. Suit (*Iowa State Col. Jour. Sci., 8 (1933), No. 1, pp. 131–173, pls. 6, fig. 1*).—Examination of 20 varieties of 2-year and 2-year cut-back apple trees in nurseries in 5 States showed hairy root present on all varieties. The percentage varied from 1.7 on Delicious to 45.2 on Wealthy.

"*P. rhizogenes* was found to induce three forms of hairy root on apples. Form 'A' is characterized by an abundance of fleshy roots and is the symptom of the first growing season. Form 'B' is commonly termed hairy or woolly knot and is 1-year-old hairy root. The reaction induced by *P. rhizogenes* on the aerial parts of the host shows a cluster of small rootlets that is designated as form 'C' hairy root. A higher percentage of hairy root occurred on those apple trees that had woolly aphid injury than on those trees free from this insect. Where 1-year-old Wealthy apple trees were inoculated with *P. tumefaciens* and *P. rhizogenes* and then grown for one season, stunting was evident in the former and not in the latter."

Hairy root was induced by *P. rhizogenes* on the following hosts: Sugar beet, tomato, Paris daisy, *Bryophyllum calycinum*, bean, *Coleus blumei*, *Spiraea vanhouttei*, honeysuckle, snowberry, apple, locust, mulberry, peach, *Caragana arborescens*, Russian olive, and *Cotoneaster acuminata*. It was not induced on white ash and American elm.

"When herbaceous cuttings were inoculated with *P. rhizogenes*, rooting was stimulated in 30 days on cuttings of bryophyllum and Paris daisy, while no difference was noted on coleus. Similar inoculations on hardwood cuttings showed a stimulation of rooting of cuttings of apple seedling, Wealthy apple, and *S. vanhouttei*."

The wedge graft wrapped with adhesive tape was the most effective way of reducing hairy root on piece-root-grafted apple trees on the variety studied.

Effect of scab-preventive treatments on apple-tree growth and yield, D. FOLSOM (*Phytopathology, 23 (1933), No. 1, p. 11; also in Maine Sta. Bul. 369 (1933), p. 587*).—This contribution from the Maine Experiment Station is an abstract of a paper presented by the author at the annual meeting of the American Phytopathological Society in 1932. A young McIntosh apple orchard was arranged in 45 replicated plats receiving different treatments for scab control through a 5-year period. At the end of this time no significant differences in trunk growth in thickness could be found in the different plats. Dry-mix sulfur, sulfur dust, lead arsenate, dry lime-sulfur, and flotation sulfur were included in the trials. In an older-bearing orchard of the same variety, dry lime-sulfur tended, in general, to increase fruit yield, but did not significantly affect trunk growth. No significant correlation was found within the same season between leaf scab, leaf-spray injury, yield, and growth.

Raspberry mosaic control in the Hudson Valley, W. H. RANKIN (*New York State Sta. Circ. 142 (1934), pp. 4*).—This is a nontechnical account of the raspberry mosaic situation under the special conditions prevailing in the Hudson Valley, where the rate of spread is more rapid than in other parts of New York State on account of the greater abundance of the raspberry aphid which carries the virus. These conditions make impractical for this region the use of mosaic-free stock, isolation of new plantings, and roguing of most varieties as means of effective control. The use of disease-free, mosaic-resistant Latham, maintained in a high state of vigor, is suggested. The new variety Newburgh is recommended for trial as likely with certain precautions to escape damaging infection.

Copper and mildew [trans. title], G. VILLEDIEU (*Prog. Agr. et Vitic., 49 (1932), No. 49, pp. 536–539*).—Bordeaux mixture is reported as effective against grape mildew, but a fresh application must be made after each heavy rain. Some vineyards which made as many as 21 and 23 applications during a rainy season secured complete control of the disease, while others which depended upon one spray to be effective during more than one rain suffered severe losses. Unwise use of chemical fertilizers, particularly nitrogen and phosphorus, is reported as inducing greater susceptibility to mildew.—(*Courtesy Biol. Abs.*)

Nigrospora musae n.sp. and its connexion with "squirter" disease in bananas, E. I. McLennan and S. Hoëtte (*Aust. Council Sci. and Indus. Res. Bul. 75 (1933), pp. 36, pl. 1, figs. 14*).—This fungus was determined to be the cause of a troublesome type of soft rot of the Cavendish banana in Australia, which is responsible for considerable break-down during storage and transportation. The organism is described and illustrated. Its relation to the host tissue is discussed. Further work is in progress to locate the main sources of infection and to devise suitable measures for its prevention.

Citrus canker, due to Pseudomonas citri, in the Punjab, D. S. Johar (*Indian Sci. Cong. Proc.* [*Calcutta*], *19 (1932), pp. 294, 295*).—It is reported that Bordeaux mixture (4-4-50) and Bordeaux oil emulsion sprayed on plants affected with citrus canker prevented further spread of the cankerous spots that season.

Penicillium rot of oranges and the conditions affecting its appearance in Palestine, I. Reichert and E. Hellinger (*Hadar, 6 (1933), No. 4, pp. 90–93, figs. 6*).—Records obtained through the 1930–31 season indicated that early-picked (November) fruit showed the least *Penicillium* rot, and late-picked fruit (March) the most. The older the fruit, the more subject it was to the rot. The heaviest attacks were sustained by second quality fruit, by fruit on lighter soils, and by fruit in the upper part of the trees. More rot was present in fruit on the east side than in fruit on the west side of the trees. In one orchard Bordeaux spray reduced the rot considerably.

A spraying experiment for the control of bacterial black spot in mangoes, V. A. Wager (*So. African Jour. Sci., 30 (1933), pp. 250–254*).—Black spot (*Bacillus mangiferae*) was prevented to a great extent by spraying with a copper-lime spray. Bordeaux mixture and Bouisol resulted in an increase of approximately 40 percent in the number of fruits free of black spot as compared with controls. Four or five sprayings, starting with the first sign of the disease, are advised, depending on weather conditions, the spraying to be done preferably the day following a rainy spell. It is recommended that the last spray be applied at the time of the first picking.

Yeasty rot of pineapples and its control, H. K. Lewcock (*Queensland Agr. Jour., 41 (1934), No. 2, pp. 128–131, fig. 1*).—Yeasty rot is reported to occur under both field and transportation conditions in Queensland. The symptoms of this disease, due to species of *Saccharomyces*, are described. Maturity of fruit, high temperature, and heavy rains at ripening time following drought are predisposing factors. Greatest injuries occur during transportation; therefore, cracked or abraded fruits should be discarded, packing of wet fruit should be avoided, and strict sanitation should be followed in field and packing shed.

Aphides as vectors of "breaking" in tulips, II, A. W. McK. Hughes (*Ann. Appl. Biol., 21 (1934), No. 1, pp. 112–119, pl. 1*).—In further studies (E.S.R., 63, p. 256) three types of breaking are distinguished—full, self, and clotted, and the evidence points to full break being the product of two viruses. Self breaking may be selectively transmitted by the aphid vectors *Myzus persicae* and *Macrosiphum gei*. Self break tulips transmit only self breaking. Clotting is an expression of full break in dark purple and dark red varieties with a shiny texture to the petals. *Anuraphis tulipae* is a definite vector in the bulb store but not on the growing plant. At a certain stage of growth tulips cease to be susceptible to infection.—(*Courtesy Biol. Abs.*)

Cytospora infection following fire injury in western British Columbia, J. Dearness and J. R. Hansbrough (*Canad. Jour. Res., 10 (1934), No. 1, pp. 125–128*).—Data are given concerning the appearance of *Cytospora* spp. on 15 species of shrubs and trees following a light ground fire near D'Arcy, B.C. On

11 of the hosts was found a species of *Cytospora* which is herein described under the name *C. pulcherrima* n.sp. This is possibly a stage of *Valsella pulcherrima*. It is known only from British Columbia and Washington. On 3 of the hosts was found an undetermined *Cytospora* with larger spores and darker, less delicate tendrils. On the 1 coniferous host present, Douglas fir, the only fungus present was determined as *C. friesii*.

The taxonomic importance of the study rests on the range of species of infected hosts which revealed a width hitherto unknown or at least unreported for a *Cytospora*.—(*Courtesy Biol. Abs.*)

Wound gums and their relation to fungi, W. H. RANKIN (*Natl. Shade Tree Conf. Proc., 9 (1933), pp. 111–115*).—A résumé of current ideas about wound gum and tylosis formation in deciduous trees in relation to wood-invading fungi is presented as an argument for the use in tree surgery of wound dressings, paints, or cavity fillings which will encourage a full development by the tree of wound gums and tyloses.

Destruction phenomena in beech caused by Hypoxylon coccineum [trans. title], C. A. JØRGENSEN and C. FERDINANDSEN (*Dansk. Skovfor. Tidsskr., No. 9 (1933), pp. 389–402, figs. 5*).—Beech is not very durable after it is cut. It is quickly attacked and spoiled by *H. coccineum*, even though the exterior of the log shows few signs of the rot. The character of the damage is described, as well as the habits and appearance of the fungus.

To minimize infection, the cut logs should be worked up quickly and should not be stored with the bark intact. The sawed products can be sprayed with a $CuSO_4$ solution. The wood should be removed from the forest before it dries out and cracks.—(*Courtesy Biol. Abs.*)

The "damping-off" of coniferous seedlings and its control, A. KHRISTOV (CHRISTOFF) ("*Sīechenīeto" na iglolistniīa razsad i srīedstvata za bora s nego. Sofiya (Sofia): Koop. Pechatnitsa "Gutenberg", 1934, pp. [2]+55; Eng. abs., pp. [2]; reprinted from Jour. "Gorski Pregled", 19 (1933), No. 9–12*).—Descriptions are given of damping-off and of nonparasitic diseases that resemble it in coniferous seedlings. Damping-off is a most serious disease of conifers in the forest nursery near Sofiya, and is known to occur also in other forest nurseries in Bulgaria. Isolations from diseased seedlings of *Pinus sylvestris*, *P. strobus*, *Picea* spp., and *Acer* spp. showed the most important damping-off parasites to be *Pythium debaryanum* and *Rhizoctonia solani*. A large number of species of *Fusarium* were also isolated. *P. debaryanum* appeared to be more difficult to control than the other organisms.

Experiments for determining the most satisfactory and cheapest treatments were conducted in beds and in pots. The soil in the pots was infected with a very virulent strain of *P. debaryanum*. All disinfectants were applied after the sowing of *Pinus sylvestris* seed at the rate of 10 l per square meter. Hydrogen superoxide (1 to 2 percent) prevented the loss of germination but did not control the usual damping-off. Three percent $CuSO_4$ produced much chemical injury, and 1 percent gave good but not satisfactory results. $K_2Cr_2O_7$ (0.05 to 0.5 percent) caused heavy chemical injury and did not control damping-off. Alcohol solution 1:50 reduced the germination, but 1:100 was better. Acetic acid (0.1 to 0.2 percent) and boric acid (0.001 percent) gave very good results. The latter is the cheapest fungicide known. $HgCl_2$ gave good results at 0.2 percent. Uspulun (0.3 percent) was toxic to the seed. Uspulun-universal (0.3 percent) gave better results than $HgCl_2$, $CuSO_4$, or Uspulun. Germisan (0.25 percent) gave excellent results. Solbar (0.5 percent) was very poor as a soil disinfectant. Lime-sulfur (27° B.), 1:30, 1:100, and 1:120 gave poor results. A summary of treatments by others is also given.

Examination of normal *P. sylvestris* seed usually showed mycelia on the seed coats. After external disinfection such seed were placed on agar, but no fungi developed, showing that they were not internally infected. All seeds used in the tests, however, were pretreated with 0.25 or 0.5 percent of Uspulun-universal for from 1 to 2 hr.

How the Dutch elm disease reached America, R. K. Beattie (*Natl. Shade Tree Conf. Proc., 9 (1933), pp. 101–105*).—An account of the discovery of *Graphium ulmi* in the United States and of the part which elm burls from Europe may have played in its introduction is followed by an outline of the proposed campaign against it.

The Dutch elm disease in New Jersey, R. P. White (*Natl. Shade Tree Conf. Proc., 9 (1933), pp. 105–110*).—An account is given of the activities of the State and Federal authorities following the discovery of the presence of the disease in New Jersey.

An undescribed Phomopsis from Douglas fir on the Pacific coast, G. G. Hahn (*Mycologia, 25 (1933), No. 5, pp. 369–375, pl. 1*).—A hitherto unrecognized species of *Phomopsis* found producing cankers on young Douglas fir (green form) in Napa, Trinity, and Mendocino Counties, Calif., and Josephine County, Oreg., is described as *P. lokoyae* n.sp.

The parasitism of Rigidosporus microporus (Fomes lignosus) on Hevea brasiliensis [trans. title], W. H. de Jong (*Arch. Rubbercult. Nederland. Indië, 17 (1933), No. 4–6, pp. 83–104; Eng. abs., pp. 101–104*).—The cause of root decay was determined on several thousand trees on estates near Kisaran, on the east coast of Sumatra. Except in cases of *Ustulina* infection *R. microporus* was universally present on decayed root systems of trees of all ages up to 22 yr. Mycelium of the fungus was found in decaying bark and wood. The rot is sometimes dry and sometimes wet, the latter condition probably due to secondary bacterial infection. Inoculations with pure cultures resulted in growth of mycelium on roots, but did not cause decay. Wounds did not appear to stimulate infection.

Wood decayed by the fungus when used as an inoculum caused infection, and the size of the inoculum appeared to be an important factor. Inoculations with fruits of the fungus gave a good growth of mycelium, but the disease did not reach the decay stage.

The fungus appears to be a weak parasite on rubber, and the decay due to it frequently ceases without treatment. Where death of an infected tree occurs the author believes it due to special environmental conditions which affect the virulence of the fungus and the susceptibility of the tree. The factors believed to lead to serious attack of the tree by the fungus are considered.—(*Courtesy Biol. Abs.*)

Contributions to the study of spike-disease of sandal (Santalum album Linn.).—XV, The role of plant acids in health and disease, A. V. V. Iyengar (*Jour. Indian Inst. Sci., 16A (1933), No. 8, pp. 139–152, figs. 3*).—Leaves from healthy and diseased sandal from different localities were examined by microchemical and macrochemical methods for the several organic acids present in them. It was observed that the tissues and the tissue fluids from the healthy plants contain more malic acid and much larger quantities of oxalic acid than the diseased plants. On the other hand, succinic acid was prominent in the spiked tissues and tissue fluids while being completely absent from, or present only in traces in, the healthy material.

An apparatus for extracting large quantities of solutions with light solvents has been described. Titrations against acid or alkali showed that the disease brings about a disturbance in the buffering capacity of the tissue fluid. The

tissue fluids from spiked sandal contain more phosphates than those from the healthy. Carbon dioxide production is more intense in the case of spiked leaf tissue than in healthy tissue. On the other hand, cut shoots (with leaves) from the spiked plant give out less carbon dioxide per unit weight than the corresponding healthy specimens.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report of work with economic insects, wild fowl, and mammalian predators at the Iowa Station] (*Iowa Sta. Rpt. 1933, pp. 68–76, figs. 2*).—The work of the year included white grub investigations, by C. J. Drake and E. V. Collins; time and labor factors involved in gathering, ripening, and storing of honey by honeybees, influence of meteorological factors upon honey production, stock replacement in honeybees, and studies on the races of bees, all by O. W. Park; bionomics and control of the apple maggot (*Rhagoletis pomonella* Walsh) and toxicology of grasshopper baits, both by C. H. Richardson; wheat insect pest survey, biology and control of onion insects, and a survey of potato insects, all by Drake; cornstalk borers and the ecology and control of sod webworms in sod land and cultivated fields, both by G. C. Decker; ecology of wild waterfowl and of gallinaceous game birds and food habits of avian and mammalian predators, all by P. L. Errington; and a study of egg depositions, poisons, attrahents, and parasites of injurious grasshoppers, by Drake and Richardson.

Control of rodents in the orchard, T. J. Talbert (*Missouri Sta. Circ. 178 (1934), pp. 12, figs. 6*).—A practical account of the ways in which rodent injury to orchards may be prevented.

The birds of tropical West Africa, with special reference to those of the Gambia, Sierra Leone, the Gold Coast, and Nigeria, II, III, D. A. Bannerman (*London: Crown Agents for Colonies, 1931 vol. 2, pp. XXIX+428, pls. 16, figs. 114; 1933, vol. 3, pp. XXXV+487, pls. 13, figs. 144*).—Volume 2 of this work (E.S.R., 64, p. 237) continues with orders IX–XIII in the classification adopted, carrying it to the end of the Psittaciformes or parrots, and volume 3 includes orders XIV–XXIII and completes the families not included in the Passeriformes or perching birds. The 5 orders with 16 families considered in volume 2 are represented by 185 forms. Sixteen families, representing 291 species and subspecies, commencing with the owls and closing with the woodpeckers, are considered in volume 3.

Preliminary report on the control of Achatina in Batavia [trans. title], S. Leffmans (*Landbouw [Buitenzorg], 9 (1933), No. 6, pp. 289–298; Eng. abs., pp. 297, 298*).—An account of this snail pest of vegetables in Batavia, which enters houses and is a source of annoyance.

Snail farming [trans. title], C. Arnould (*Agr. Nouvelle [Paris], 43 (1933), No. 1673, pp. 313, 314, figs. 4; abs. in [Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Roma], 24 (1933), No. 9, p. 395*).—This refers briefly to the breeding of edible snails (all species of the genus *Helix* being edible), their habits and breeding pens. It is pointed out that breeding requires three years and is practiced in large enclosures with suitable conditions, avoiding overcrowding.

***A* check-list of the Coccidia of the genus Isospora,** E. R. Becker (*Jour. Parasitol., 20 (1934), No. 3, pp. 195, 196*).—The author lists 48 forms as belonging to the genus *Isospora*.

[Work with economic insects at the Arkansas Station, 1887 to 1933] (*Arkansas Sta. Bul. 297 (1934), pp. 26–33, 46–48, 57, 71–73, 85–88, 93, 94, 96, 97, 98*).—This summary of research includes studies of the boll weevil, cotton leaf worm, garden webworm, cotton aphid, leaf bugs on cotton, red spider on

cotton, southern corn rootworm, rough-headed cornstalk beetle (*Euthcola rugiceps*), rice weevil, lesser grain borer (*Rhizopertha dominica* Fab.), bean leaf beetle, rice water weevil, codling moth, apple tent caterpillar, grape rootworm, grape berry moth, cutworms on grapes, strawberry crown borer, strawberry weevil, and striped cucumber beetle.

Connecticut State entomologist, thirty-third report, 1933, W. E. BRITTON (*Connecticut* [*New Haven*] *Sta. Bul. 360* (*1934*), *pp. 383–486+XXVII–XXXII, figs. 16*).—Following reference to entomological features and an insect record for 1933 (E.S.R., 69, p. 546), reports of conferences on the European pine shoot moth and of Connecticut entomologists are given. Regulatory work of the year dealt with includes the inspection of nurseries, by Britton and M. P. Zappe (pp. 407–419); inspection of imported nursery stock (p. 419); inspection of apiaries, by Britton (pp. 420–425); and gypsy moth, by J. T. Ashworth and Britton (pp. 426–433), European corn borer, by Britton, Zappe, and J. P. Johnson (pp. 433–440), Japanese beetle, by Johnson (pp. 440, 441), and mosquito control work, by R. C. Botsford (pp. 442, 443). There follow accounts of tests of mosquito light traps and larvicides (pp. 444, 445) and control of the potato flea beetle (pp. 445, 446), both by N. Turner; tests of various apple sprays, by Zappe and E. M. Stoddard (pp. 447, 448); control of the white apple leaf hopper, by P. Garman and J. F. Townsend (pp. 449–451), a report of which by Garman has been noted (E.S.R., 71, p. 347); orchard experiments with substitutes for lead arsenate (pp. 451–458), a study of aphicides (pp. 458–461), and a report on fruit moth parasites (pp. 462, 463), all by Garman; studies on a European species of *Trichogramma* (*T. euproctidis* Girault), by J. C. Schread (pp. 463–466); damage by the Asiatic or Japanese garden beetle (*Autoserica castanea* Arrow) (pp. 466–468), injury to fruit by the rose leaf beetle (pp. 469–471), and the green gold leaf beetle (*Chrysochus auratus* Fabr.) as a pest of roses (pp. 471, 472), all by Britton; and the gladiolus thrips, by B. H. Walden (p. 473). Miscellaneous insect notes presented (pp. 474–483) deal with the sorrel weevil (*Phytonomus rumicis* Linn.), another European weevil in Connecticut (*Polydrusus sericeus* Schall.), injury to raspberry plants by June beetles, severe damage to grapevines by the light-loving grapevine beetle (*Pachystethus lucicola* Fabr.), poplar trees defoliated by the satin moth, large scale breeding of *Dibrachys* parasites, sprays for the control of the European pine shoot moth (E.S.R., 71, p. 350), further damage by *Pseudocneorrhinus setosus* Roelofs, the strawberry root weevil in houses, lesser European elm bark beetle (*Scolytus multistriatus* Marsh.), injury to tomatoes by the common field cricket, a tropical moth in Connecticut (*Pseudosphinx tetrio* Linn.), pepper plants severely damaged by the variegated cutworm, control of clothes moths in pianos, control of onion thrips, Mexican bean beetle investigations, and six species of pine tip moths occurring in Connecticut (*Rhyacionia buoliana* Schiff, *R. rigidana* Fernald, *R. comstockiana* Fernald, *R. frustrana* Comstock, *Eucosma gloriola* Heinrich, and *Battaristis vittella* Busck.

[Contributions on economic insects] (*Conn. Pomol. Soc. Proc., 42* (*1932*), *pp. 15–33, 35–37, 55–67, 71–75*).—Contributions presented at the annual meeting of the society (E.S.R., 68, p. 496), held at Hartford in December 1932, include the following: Tests of Various Apple Sprays in 1932, by M. P. Zappe and E. M. Stoddard (pp. 15–18); Control and Life History of the White Apple Leafhopper, by P. Garman (pp. 19–25); The Apple Maggot: Its Life History and Habits in Relation to Control, by C. R. Phipps (pp. 26–33); Report on the Oriental Peach Moth Situation in Connecticut, by P. Garman (pp. 35–37); Arsenical Injury on the Peach, by W. C. Dutton (pp. 55–67); and Report of Committee on Injurious Insects, by W. E. Britton (pp. 71–75).

[**Contributions on economic insects**] (*Ill. State Hort. Soc. Trans., 67 (1933), pp. 168–192, 366–368, 491–505, figs. 3*).—The contributions presented at the 1933 annual meetings (E.S.R., 69, p. 385) include the following: The Present Status of Oil Sprays, by M. D. Farrar (pp. 168–174); Codling Moth Experiments during 1932–1933, by W. P. Flint (pp. 175–183); Codling Moth Control, by B. A. Porter (pp. 184–192); Observations on Orchard Insects in Northern Illinois, by L. H. Shropshire (pp. 366–368); and The Most Effective Spray for Codling Moth Control, by W. P. Flint and S. C. Chandler (pp. 491–505).

[**Report of work in entomology at the Maine Station**] (*Maine Sta. Bul. 369 (1933), pp. 551–555*).—Brief reference is made to the progress of work during the year (E.S.R., 69, p. 385), including that with the apple fruit fly or railroad worm, by C. O. Dirks; insects affecting the blueberry, by Dirks and I. C. Mason; and wireworms, by J. H. Hawkins.

[**Report of work with economic insects and their control by the Massachusetts Station**] (*Massachusetts Sta. Bul. 305 (1934), pp. 22, 23, 28–36, 48, 61, 62*).—The work of the year with economic insects and their control, referred to, includes that with injurious and beneficial insects affecting the cranberry, by H. J. Franklin; investigations of materials which promise value in insect control, control of onion thrips, the spray residue problem, systematic study of oil sprays, apple maggot control, and introduction of *Macrocentrus ancylivorus* as a parasite of the oriental fruit moth, all by A. I. Bourne; the plum curculio, biology and control of the apple leaf-curling midge (*Dasyneura mali* Kieffer) and the carrot rust fly, adaptability of *Cryptolaemus montrouzieri* Muls. to control of mealybugs in the greenhouse, naphthalene and similar materials as greenhouse fumigants, and control of red spider on greenhouse crops, all by W. D. Whitcomb; oil sprays, by E. B. Holland; and control of cabbage maggot, by Whitcomb and H. A. Wilson.

[**Report of control work with economic insects in New Hampshire**] (*New Hampshire Sta. Bul. 280 (1934), pp. 16–19*).—Reference is made to the work of the year (E.S.R., 69, p. 385) with the codling moth, by E. J. Rasmussen; spraying v. picking drops for railroad worm control, by W. C. O'Kane and J. G. Conklin; and contact insecticides, by O'Kane, Conklin, L. C. Glover, and W. A. Westgate.

[**Contributions on economic insects and insecticides**] (*Penn. State Hort. Assoc. Proc., 74 (1933), pp. 36–40; 75 (1934), pp. 31, 32, 38–60, 75–86*).—The proceedings of the society for 1933 include a Report of the Committee on Insect Pests, by T. L. Guyton, H. N. Worthley, and H. E. Hodgkiss (pp. 36–40).

The contributions presented at the annual meeting of the association held in January 1934 include the following: Keeping Bees in the Orchard, by E. F. Phillips (pp. 31, 32); Results of Codling Moth Experiments in 1933, by H. N. Worthley (pp. 38–40, 42–44, 46–48); Codling Moth and Rosy [Apple] Aphis Suppression, by H. E. Hodgkiss (pp. 50–52, 54–56, 58–60); and Tar Distillate Emulsions for the Control of the Rosy [Apple] Aphid, by F. Z. Hartzell (pp. 75, 76, 78–86).

Pests and parasites, J. C. F. Fryer (*Jour. Roy. Agr. Soc. England, 94 (1933), pp. 335–358*).—This contribution dealing with the important insects in Great Britain in 1932 is presented in connection with a list of 61 references to the literature.

[**Contributions on economic insects in China**] (In *1932 Year Book. Hangchow, China: Bur. Ent., 1933, pp. 59–191, 199–271, 287–383, 425–434, pl. 1, figs. 122*).—Contributions presented include the following: Some Preliminary Notes on the Life History of the Rice Grasshopper *Oxya chinensis* Thunb., by C. Liu

and S. Li (pp. 59–70, Eng. abs. pp. 65–67); A List of the Disease-Carrying Anophelines in the World, by F. Li (pp. 71–98, Japan. abs. pp. 87–89); A List of the Butterflies of Chekiang in the Bureau—I, Family Papilionidae, II, Family Pieridae, by C. Wong and C. Tao (pp. 99–123, Japan. abs. p. 123); The Biology and Control of the Mulberry White Caterpillar *Rondotia menciana* Moore (Lepidoptera, Bombycidae), by J. Chu (pp. 124–182, Eng. abs. p. 125); Analysis of the Stomach Contents of Two Species of Frogs (*Rana limnocharis* and *R. nigromaculata*) in the Vicinity of Kashing, with Special Reference to Insects, by C. Liu and K. Chen (pp. 183–191, Japan. abs. p. 191); The Damage Due to *Icerya purchasi* Mask. in Chekiang and Its Estimated Loss in Hwangyen District, by M. Jen (pp. 199–204, Eng. abs. p. 204); Notes on the Biology of Two Giant Coccinellids in Kwangsi (*Caria dilatata* Fab. and *Synonycha grandis* Thunb.), with Special Reference to the Morphology of *C. dilatata*, by C. Liu (pp. 205–250, Japan. abs. p. 205); An Experiment with the Various Heights and Intensity of Light for Trapping Insects, Particularly for Rice Borers, Moths, and Leafhoppers, by C. Wang (pp. 251–260, Eng. abs. p. 260); Experiments for the Control of Mulberry White Caterpillar *Rondotia menciana* Moore with Insecticides, by F. Chen (pp. 261–266, Eng. abs. p. 266); An Experiment with Straw Binding around the Trunk and Large Branches of Mulberry Trees for Trapping Insects, 1932–33, by K. Chen, N. Tsiang, and T. Sung (pp. 267–271, Eng. abs. p. 267); Notes on the Life History of *Naranga aenescens* Moore, a Leaf Feeder of the Paddy, I, by K. Cheng (pp. 287–305, Eng. abs. p. 302); An Automatic Time Lantern Trap, by Y. Lu (pp. 306–322, Eng. abs. p. 306); A Preliminary Survey of Malaria and Anophelines in Hangchow, by F. Li and S. Wu (pp. 323–331, Eng. abs. p. 323); A Compilation and Deduction of the Insect Pests Recorded in the History of All the Districts at Chekiang, by K. Hsu (pp. 332–363, Eng. abs. pp. 332, 333); A Record of the Local Name for the Mulberry White Caterpillar in Chekiang, *Rondotia menciana* Moore [trans. title] (pp. 364–383); The First Official Burning of Accumulated Injurious Insects and Infested Materials [trans. title], by M. Wang (pp. 425–431); and Report of the Chekiang Provincial School of Entomology, 1932 [trans. title], by C. Wong (pp. 433, 434).

[Work with economic insects], F. E. GELDENHUYS (*Union So. Africa, Dept. Forestry Ann. Rpt., 1933, pp. 38–40, 43*).—Brief reference is made to the occurrence of and work with several of the more important insects of the year.

Entomological investigations, G. A. JULIUS ET AL. (*Aust. Council Sci. and Indus. Res. Ann. Rpt., 7 (1933), pp. 26–31*).—A report is given of the occurrence of and work with the more important insects of the year (E.S.R., 69, p. 686).

Insects injurious to alfalfa, S. B. DOTEN (*Nevada Sta. Rpt. 1933, p. 18*).—Brief reference is made to the progress of work with the alfalfa weevil (E.S.R., 67, p. 427).

Report on cotton insect and disease investigations, I–III (*Union So. Africa Dept. Agr., Sci. Buls. 94 (1930), pp. 18; 113 (1932), pp. 18; 114 (1933), pp. 29, [pls.] 4*).—Part 1 of the first contribution, which takes up the life history, bionomics, and control of cotton stainers (*Dysdercus* spp.) in South Africa, is by G. C. Ullyett (pp. 3–9). The second contribution, devoted to notes on the bollworm on cotton and on its parasite *Microbracon brevicornis* Wesm. and presented in connection with a list of 24 references to the literature, is by J. S. Taylor. The work with the bollworm parasite *M. brevicornis* is said to have been abandoned because of (1) the fact that it has only been found associated with the bollworm on *Antirrhinum*, although the bollworm occurs on a wide variety of plants, (2) the difficulty of rearing the parasite under humid

conditions and the probability that these are also a limiting factor in the field, and (3) its destruction by ants, which usually abound in cotton fields. The third contribution, by A. J. Smith, consists of notes on the red bollworm (*Diparopsis castanea* Hamps.) of cotton in the Union of South Africa.

Insect pest control (*Empire Cotton Growing Corp., Expt. Stas. Rpts. 1932–33, pp. 100–117*).—This contribution reports upon work by F. S. Parsons and G. C. Ullyett (pp. 100–111) with the American bollworm and its activity on rain-grown cotton, maize, and other crops and its activity on winter-irrigated crops and citrus orchards; larval parasites of this bollworm, including the tachinid fly *Sturmia inconspicua* Mg. and *Microbracon brevicornis*; investigations on *Trichogramma lutea* Gir.; and investigations on the red bollworm. Investigations on cotton stainers and internal boll disease, by E. O. Pearson, are also given (pp. 111–117).

A bibliography on the use of airplanes in insect control from 1922 to 1933, compiled by W. E. McBath (*U.S. Dept. Agr., Bur. Ent., [1934], pp. 37*).—This is an annotated compilation of the literature relating to the use of airplanes in control work with insects.

Injury from calcium arsenate-hydrated lime spray on snap beans retarded in growth by unfavorable soil conditions, L. W. Brannon (*Jour. Agr. Res. [U.S.], 48 (1934), No. 5, pp. 447–451, figs. 2*).—In the studies here reported, the details of which are presented in tabular and chart form, "four treatments of calcium arsenate-hydrated lime spray (1:2:50) were applied to snap beans grown on soils having approximately the following pH values: 7.6, 7.0, 6.5, 6.0, 5.7, 5.2, and 4.8. Yields were recorded, and the effect of spraying on yield, check-plat basis, was calculated from the mean yields in grams per plant. On this basis, treatment was found to result in serious reductions in per plant yields on the plats with pH values of 7.6 and 7.0, slight reductions on the plats at pH 6.0 and 5.2, and slight increases on the plats at pH 6.5, 5.7, and 4.8."

A biometrical analysis of the data was made by Student's method, as described by Hayes and Garber in 1927 (E.S.R., 58, p. 29). "Odds greater than 30 to 1 that the reductions were not due to chance alone were obtained on the pH 7.6, 7.0, and 6.0 plats. In the case of the first two plats, on which reductions in yield were 72 and 31 percent, respectively, the odds were very great, approximately 5,000 to 1 and 1,300 to 1, respectively. In the case of the pH 6.0 plats, on which the reduction was 12 percent, the odds of a significant reduction in the yield of the treated plats under the check were only 46 to 1. Arsenical injury was considerably more severe on the plants grown in soil at pH 7.6 and pH 7.0 than on plants grown in soil at any of the other reactions. Severe chlorosis was apparent on check and treated plats, and check yields were considerably lower than at any other pH value.

"The maximum check-plat yield was obtained on the pH 6.0 plats; the optimum range was between pH 6.5 and pH 5.2. The results of the experiment indicate that snap beans retarded in growth by unfavorable soil conditions are decidedly more susceptible to arsenical injury from calcium arsenate-hydrated lime spray than are plants grown under optimum conditions."

Dormant sprays and their use for the control of insect pests of fruit trees in the Rogue River Valley, L. G. Gentner and R. K. Norris (*Oregon Sta. Bul. 321 (1933), pp. 55, figs. 18*).—Following a brief introduction, the authors deal with the susceptibility of pear varieties to injury from dormant sprays, based upon work from 1924 to 1932, inclusive; the susceptibility of the Yellow Newtown apple to injury from dormant sprays, 1925–32; the control of the San Jose scale by means of dormant sprays, 1925–31; the control of pear

leaf blister mite, based upon tests of 1926 and 1932; and the control of rust mites on pears.

It is found that when used on pear trees "mineral oils having a viscosity range of from 100 to 120 sec. Saybolt and sulfonation test of from 50 to 70 percent are satisfactory for use in dormant sprays. Most of the commercial emulsions which are now on the market conform to these specifications and can be used with safety when applied as recommended.

"Tests carried on by the Southern Oregon Experiment Station since 1924 lead to the conclusion that dormant-type oil sprays at 4 percent strength, conforming to the foregoing specifications, may be applied in the spring with reasonable safety to all of the leading varieties of pears grown commercially in the Rogue River Valley, except Winter Nelis. Applications may be made at any time from the period that the buds are completely dormant until the cluster buds are separating. When these sprays are applied after the early pink stage they may burn the petals severely enough to interfere with normal opening and pollination."

The dormant-type mineral oils used on apple trees should have the same specifications as those used on pear trees. "These oils should cause no injury to Yellow Newtown apple trees under Rogue River Valley conditions when they are applied at 4 percent strength in the spring up to the time that the buds show the green leaf tips. When applied late, they may delay the development of leaf buds more or less, and when applied after the young leaves have partly expanded they may burn the tips and margins, but usually not in a serious way unless applied very late. Lime-sulfur at the rate of 12 to 100 gal. may burn the young leaves to some extent when applied late in the spring, but otherwise has no noticeable effect on the development.

"Tests carried on over a period of years by this station show that San Jose scale may be controlled satisfactorily by the application of either liquid lime-sulfur, 12 to 100 gal., or a 4 percent oil spray, applied in the spring during the dormant or delayed dormant period. Oil sprays, however, should not be applied in the fall because of possible injury. Dry lime-sulfur, 30 lb. to 100 gal., gave satisfactory control in the years when favorable weather conditions prevailed, but in other years resulted in poorer control than was obtained with liquid lime-sulfur. Dormant sprays of either lime-sulfur or oils on the larger branches may kill young summer scales which attempt to settle on them. . . .

"At the present time indications are that blister mite may be controlled in this valley by liquid lime-sulfur, 12 to 100 gal., or dormant-type oil sprays at 4 percent strength when applied before the tips of the leaves show. Since more than 800 mites have been found in a single pear bud, it is important to cover every bud thoroughly to obtain control. Liquid lime-sulfur will give commercial control on pear trees when applied after the tips of the leaves show. Both liquid lime-sulfur, 12 to 100 gal., and dry lime-sulfur, 30 lb. to 100 gal., will prevent serious injury when applied up to the time leaf buds are 0.5 in. in length. Lime-sulfur may be applied effectively over a longer period than oil. In case of severe infestation it is safer to use lime-sulfur. Further tests are necessary to establish more definitely some of the factors concerning the control of this pest."

The same sprays as applied to blister mite should control rust mite.

Hot water treatment and its application to the control of certain plant pests, W. E. H. Hodson (*Agr. Prog.* [*Agr. Ed. Assoc., Gt. Brit.*], *10* (*1933*), *pp. 180–183*).—In experiments conducted from 1930 to 1933, during which many thousands of strawberry runners were immersed in water at 110° F. for from 20 to 30 min., the treatment was found to destroy the mites (*Tarsonemus fragariae*) and other pests, with the possible exception of the eelworm *Aphelen-*

chus fragariae. It is pointed out that the treatment must be applied between April 1 and November 1 and before transplanting. When the conditions recommended are observed, not more than 2 percent of the plants will be lost. Tested under practical field conditions in which commercial stock or runners were used, the plants were found to be most effectively handled when bagged in lots of 250 in order that penetration of the heat be both rapid and uniform. Sprout nets proved ideally adaptable for the purpose, and each bag was cooled under an oast on removal from the tank. It was observed that strawberry runners will tolerate an exposure of 5 min. to a temperature of 116° but are rapidly killed at 118°.

Grasshopper-bait tests in Colorado, F. T. COWAN (*Colorado Sta. Tech. Bul. 7 (1934), pp. 18*).—Following a review of the literature in connection with a list of 23 references, the author reports upon grasshopper-bait experiments conducted in 1931 and 1932.

The work of 1931 demonstrated that grain screenings, mill sweepings, and other waste materials cannot be used as substitutes for bran. Salt was found to be unnecessary in the grasshopper baits for Colorado and dried beet pulp to have possibilities as a substitute for bran. The results of the work in 1932, although not as outstanding as those of 1931, do more or less substantiate them. "Amyl acetate was again found unnecessary in the cane molasses bait, but may be used to advantage in combination with beet molasses. Dried beet pulp, when mixed with beet molasses and amyl acetate, gave as good results as bran for this particular year. Paris green kills a little quicker than either of the sodium arsenites or sodium fluosilicate. It may also give a higher percentage of kill. In price both paris green and sodium fluosilicate are much higher than the sodium arsenites. This fact should almost exclude their use in large campaigns. Of the two sodium arsenites, the liquid is probably slightly cheaper. The difference, however, might well be made up in additional freight if the material must be shipped any great distance, since the equivalent of 2 lb. of the dry material, in the liquid, weighs 4.5 lb."

It is pointed out that the formula which is to be used in the various States will vary according to the materials available. The results of the 2 years' work here reported led to the recommendation of the following formulas for Colorado: For irrigated lands (1) bran 100 lb., beet molasses 2 gal., amyl acetate 3 oz., sodium arsenite (liquid 8-lb. material) 1 qt., and water 10 to 12 gal., or (2) bran 100 lb., beet molasses 2 gal., amyl acetate 3 oz., sodium arsenite (dry) 2 lb., and water 10 to 12 gal.; and for dry land, bran 100 lb., sodium arsenite (liquid) 1 qt., sodium arsenite (powder) 2 lb., and water 10 to 12 gal.

Grasshopper plagues and early Dakota agriculture, 1864–1876, H. E. BRIGGS (*Agr. Hist., 8 (1934), No. 2, pp. 51–63*).—A discussion of the importance of grasshopper invasions in the Dakotas in the early days of their settlement.

Observations on phases of the red-winged locust in Northern Rhodesia, A. P. G. MICHELMORE and W. ALLAN (*Bul. Ent. Res., 25 (1934), No. 1, pp. 101–128, figs. 5*).—Detailed observations of *Nomadacris septemfasciata* development and phase coloring, carried out during the 1932–33 breeding season that extended from December until April, are reported.

The Cydnidae and Pentatomidae of Cuba, H. G. BARBER and S. C. BRUNER (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 3, pp. 231–284, pls. 3, fig. 1*).—This contribution, which includes a number of species widely distributed in the West Indies and known also to occur in Puerto Rico, is based largely on specimens in the collections of the Cuban Agricultural Experiment Station at Santiago de las Vegas and of the junior author. Tables are given for the

Cuban families and subfamilies, genera, and species. Descriptions of 11 new forms are included, as is an index to the genera and species. The genus *Praepharnus* is erected.

Fighting the chinch bug on Illinois farms, W. P. FLINT, G. H. DUNGAN, and J. H. BIGGER (*Illinois Sta. Circ. 419 (1934), pp. 16, figs. 6*).—This is a practical account of the control of the chinch bug through the growing of crops on which it does not feed, adjusting rotations, the planting of varieties of corn that are relatively resistant to its attack, and building effective barriers to prevent the bugs from invading fields of corn.

The louse as a menace to man: Its life-history and methods for its destruction, J. WATERSTON (*Brit. Mus. (Nat. Hist.), Econ. Ser. No. 2, 2. ed. (1933), pp. 20, pl. 1, figs. 2*).—A new edition of this contribution (E.S.R., 37, p. 762).

Four new species of Empoasca (Homoptera: Cicadellidae), F. W. POOS (*Ent. Soc. Wash. Proc., 35 (1933), No. 8, pp. 174–179, figs. 6*).—Four species of leaf hoppers of the genus *Empoasca* here described as new are *E. sativae*, collected on alfalfa at Leavenworth, Kans., and at Baton Rouge, La., and in trap lights at Knoxville, Tenn., and Rosslyn, Va.; *E. delongi*, collected near Occoquan, Va., from horsenettle (*Solanum carolinense*) and reared on potato in confinement; *E. batatae*, reared on sweetpotato in a greenhouse at Rosslyn, Va., and also collected on sweetpotato at Fort Myers, Fla.; and *E. curvata*, collected on honeysuckle at Rosslyn, Va., and taken in a trap light at Knoxville, Tenn.

Alfalfa yellows, L. F. GRABER and V. G. SPRAGUE (*Science, 78 (1933), No. 2026, pp. 385, 386*).—In Wisconsin so-called "alfalfa yellows", which appears primarily in the second growth, is definitely associated with increased leaf-hopper populations resulting from early cutting of the first crop. This is said to have been made clearly evident by trial cuttings of alfalfa and population counts of leaf hoppers during the preceding two years. It is pointed out that when the first cutting is deferred until the field shows abundant blossoming, the major portion of the eggs of this brood will have been deposited in the green tissues of the alfalfa. Such eggs are removed in the first crop of hay before they hatch and the populations in the second growth are greatly reduced. Although the nymphs had become adults some days prior to the cutting of the second growth on July 31 and through migration caused the yellowing of alfalfa, they disappeared rapidly after this cutting. Conditions are apparently unfavorable for their propagation during the period of the third growth, this crop rarely being seriously injured by them in Wisconsin.

"Alfalfa yellows", F. W. POOS and H. L. WESTOVER (*Science, 79 (1934), No. 2049, p. 319*).—In referring to the account above noted the authors report studies conducted in the latitude of Washington, D.C., and of Columbus, Ohio. They call attention to the fact that while it was generally true in 1933 that delayed cutting of the first crop until it showed abundant blossoming did not result in more serious injury by the potato leaf hopper to the crop following, this is not always the case.

At the U.S.D.A. Arlington Experiment Farm, near Washington, D.C., there has been observed to be a continuous and general migration of the potato leaf hopper each year from May 10 to 16 up to July 1 or later into alfalfa, after which special periods of migration take place as potatoes or other favorable hosts become less attractive as food plants. Of even more importance is the fact that this leaf hopper under the most favorable environmental conditions of weather and food plants can build up its populations to tremendous proportions within a comparatively short time. Thus, the period of ideally favorable

environmental conditions for the development of this leaf hopper, combined with the amount of migration from nearby maturing or harvested crops or from more distant areas, as well as the stage of growth at which the crop is attacked, are extremely important factors in determining the amount of injury to alfalfa that will be caused at any one time. They must be taken into consideration and their influence determined before any cutting schedule for alfalfa is adopted for controlling the injuries caused by the potato leaf hopper.

In a footnote the authors call attention to the fact that since this diseaselike injury by the potato leaf hopper is caused by an insect and is not of virus origin, and also because various shades of pink and red as well as yellow colors are usually present, it might well be referred to as "potato leaf hopper injury."

Pear mealy bugs and results of experiments for their control, F. W. PETTEY (*Union So. Africa Dept. Agr., Sci. Bul. 95 (1930), pp. 23, figs. 5*).—This discussion by the author and C. J. Joubert relates to two species of mealy bugs that are causing concern in many pear orchards in the Cape of Good Hope, namely, the grape mealy bug and *Pseudococcus gahani*. The account takes up their life history and habits briefly, their economic importance, and laboratory tests of spray materials for their control. The results are presented in detail in tabular form.

Observations of Lecanium coryli L. on ash and its fungus parasite [trans. title], A. KALANDRA and J ROZSYPAL (*Ochrana Rostlin, 13 (1933), No. 5–6, pp. 153–176, figs. 11; Ger. abs., pp. 175, 176*).—An account is given of studies of the European fruit lecanium in Czechoslovakia, where this scale has been a pest of the plum, acacia, and particularly the ash, both *Fraxinus excelsior* and *F. alba*. Studies of its plant hosts and natural enemies are reported upon. Its natural enemies include the predatory and parasitic insects *Coccinella septempunctata* L., the two-spotted lady beetle, *Exochomus quadripustulatus* L., *Anthribus nebulosus* Först., *Leucopis* sp., *Blastothrix sericea* Dalm., *Aphycus punctipes* Dalm., *Coccophagus scutellaris* Dalm., *Phaenodiscus aeneus* Dalm., and *Cerapterocerus mirabilis* Westw., and two fungi, *Cordyceps pistillariaeformis* Bk., and *Cephalosporium* (*Acrostalagmus*) *lecanii* Zimm.

The account is presented in connection with a list of 35 references to the literature.

Non-arsenical dusts for cauliflower worm control in western New York, G. E. R. HERVEY and C. E. PALM (*New York State Sta. Bul. 640 (1934), pp. 17, fig. 1*).—Comparative studies of the value of arsenicals, derris, pyrethrum, and to a less extent hellebore, in combating the imported cabbage worm, the cabbage looper, and the diamond-back moth as enemies of cauliflower, conducted during the season of 1933, are reported. "Analyses of samples of cauliflower from plats receiving various treatments of calcium arsenate indicate that there is little possibility of using this material effectively with the existing arsenical tolerance specifications." The single season's work indicates that ground derris root, the diluted dust to contain 0.5 percent of rotenone, is the best single treatment. "While pyrethrum dusts possess merit, preference at present is given to derris principally because where pyrethrum is used at strengths to give results equal to derris the cost, at present prices, is higher, and in some instances the results have not been as consistent."

Codling moth control in Idaho, C. WAKELAND and R. W. HAEGELE (*Idaho Sta. Bul. 200 (1934), pp. 26, figs. 2*).—This is a report of control work with the codling moth conducted in southwestern Idaho from 1927 to 1931, inclusive, in connection with and in continuation of the biological studies previously noted (E.S.R., 67, p. 290).

The results obtained have shown lead arsenate to be the most important single insecticide employed against this pest. Its use is recommended in all cover sprays, 2 lb. to 100 gal. of water usually being sufficient when spraying is thoroughly done and the applications properly timed. For heavy infestations or unusual conditions it is recommended that 3 lb. be used. The spotting of fruit is eliminated and residue removal is facilitated by the addition of colloidal or soap spreaders, or fish oil, to lead arsenate sprays.

Summer oils used alone do not result in a high degree of control of the codling moth. Oil should be used only in combination with lead arsenate or lead arsenate substitutes at the rate of 1 gal. of oil emulsion to each 100 gal. of spray solution. Since the effectiveness of oil depends on its egg-killing power, it is most valuable if applied at the peak of the egg-laying period. The number of applications of summer oil should not exceed two, and these are most effective when added to the first two cover sprays. One gal. of commercial oil emulsion to 99 gal. of water is sufficient. The use of nicotine sulfate (Black Leaf 40), ⅔ pt., and oil emulsion, 1 gal. to 100 gal. of dilute spray, is about equally as effective as lead arsenate, and this combination may be substituted for lead arsenate if desired.

"Better control of the codling moth has resulted in some experiments from the addition of 1 qt. of fish oil to 100 gal. of lead arsenate spray, but in general it has not increased the degree of control in Idaho. . . . The calyx spray should be applied when about 90 percent of the petals have fallen and before the calyx lobes have closed. Use lead arsenate at the rate of 2 lb. in 100 gal. of water. This spray should never be omitted. . . .

"The first cover spray should be completed within 10 days after moths begin to appear regularly in the bait traps. The second cover spray should be completed within 10 to 14 days after the first. Because of the variability of the peak of larval emergence from year to year, it is recommended that oil emulsion, 1 gal. per 100 gal. of spray, be added to both the first and second cover sprays in order to be certain that the oil will be applied to the eggs at the most effective time. In some localities, and during some seasons, it is necessary to apply a third cover spray for the first brood. This should be timed from 10 to 18 days after the second cover spray, depending on moth activity.

"The first cover spray for second-brood larvae should be completed within 8 days after moth traps show a marked increase in the number of moths captured after July 1. A second cover spray for the second brood, when needed, should be completed within 10 to 15 days after the first second-brood spray, the interval elapsing depending on weather conditions. If a third cover spray for second brood is necessary, it would be completed within another 10 days."

Recommendations on spray residue removal, prepared by H. P. Magnuson and R. S. Snyder, chemists, are included (pp. 25, 26).

Codling moth control programs, S. W. Harmon (*New York State Sta. Circ. 140 (1934), pp. 7, fig. 1*).—A practical account of codling moth control programs applicable in the State, including spray applications and supplemental measures.

[The codling moth and its control in Washington State] (*Wash. State Hort. Assoc. Proc., 29 (1933), pp. 39–96, figs. 5*).—Contributions presented at the annual meeting of the association, held in December 1933, include the following: Non-lead Sprays for Codling Moth, by J. Marshall and K. Groves (pp. 39–60); Deposit and Control, by R. L. Webster and J. Marshall (pp. 62–70); An Effective Program for Controlling the Codling Moth, by E. J. Newcomer (pp. 71–73); Some Observations concerning Spray Residue Removal in 1933, by E. L. Overholser, F. L. Overley, and J. L. St. John (pp. 74–78); 1933 Washing

Experiments with Special Reference to New Sprays, by F. L. Overley, E. L. Overholser, and J. L. St. John (pp. 79–85); and The Removal of Lead, Arsenic, and Fluorine Residues from Apples, by E. Smith, A. L. Ryall, C. R. Gross, R. H. Carter, C. W. Murray, and J. E. Fahey (pp. 86–96).

A report of further experiments of new methods for the control of codling moth in western districts of the Cape Province, F. W. Pettey (*Union So. Africa Dept. Agr., Sci. Bul. 96 (1930), pp. 50, figs. 3*).—In continuation of earlier work (E.S.R., 64, p. 750) the author reports upon the results obtained in tests conducted in 1929 and 1930 in four orchards in several districts of the Cape of Good Hope with the assistance of M. C. Mossop.

[Report of work with the sugarcane borer at the Louisiana Station] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 10–12*).—A brief summary of recent work with the sugarcane borer and its egg parasite, *Trichogramma minutum*, is presented, the details of which have been noted from other sources (E.S.R., 69, pp. 80, 836; 70, pp. 211, 365).

The sugar-cane moth borers in Mauritius, L. A. Moutia (*Bul. Ent. Res., 25 (1934), No. 1, pp. 33–46, pl. 1*).—This discussion relates to the spotted borer *Diatraea venosata* Wlk., the pink borer *Sesamia vuteria* Stoll, and the white borer *Grapholita schistaceana* Snell.

The spotted cotton boll worm (Earias insulana) (*Iraq Dept. Agr. Leaflet 25 (1932), pp. 5*).—This brief contribution deals with *E. insulana*, known in Iraq as the spiny or spotted bollworm. It is the most important of the bollworm enemies of cotton in Iraq.

Studies of the willow-shoot moth Depressaria conterminella Zell., M. and H. W. Miles (*Bul. Ent. Res., 25 (1934), No. 1, pp. 47–53, pl. 1*).—This is a report of a study by M. Miles of the biology and by H. W. Miles of the control of *D. conterminella*, the most important willow shoot borer occurring in commercial willow beds of Lancashire and Cheshire, England. It is concluded that small acreages of willow infested with this pest can be effectively checked by the late harvesting of the crop, the actual date for harvesting depending on the season.

The leaf miners of the apple and pear [trans. title], M. Hering (*Anz. Schädlingsk., 9 (1933), No. 12, pp. 149–159, figs. 16*).—A table is given for the identification of the leaf miners of the apple and pear, followed by accounts and illustrations of their work.

Employment of maggots in the treatment of osteomyelitis and other chronic surgical affections [trans. title], E. Brumpt (*Ann. Parasitol. Humaine et Compar., 11 (1933), No. 5, pp. 403–420, pls. 2, fig. 1*).—This extended discussion of the subject is presented in connection with a four-page list of references to the literature.

Observations on the blow-fly Lucilia sericata Meig., C. H. Brannon (*Jour. Parasitol., 20 (1934), No. 3, pp. 190–194*).—In work in North Carolina the author has obtained oviposition of *L. sericata* under natural conditions in every month of the year. "Eggs are usually laid beneath the outer edges of the meat; however, in a dark room, most of the oviposition was on the upper surface. Adults can be kept for an extended period at 10° C. Oviposition, hatching, larval development, pupation, and adult emergence will take place at 10°. In addition to meat, eggs were obtained on yeast, banana, beef extract agar, and ground up blowfly larvae. When given choice of fresh and rancid meat, adults show marked preference for the latter for oviposition. Larvae fed readily upon cow endocrines. In the one series carried out, thyroid seemed to shorten the pupal period. Larvae are very sensitive to excess moisture. Full-grown larvae

display a remarkable ability of survival after 24-hr. immersions in various liquids."

Growth of blow-fly larvae on blood and serum.—I, Response of aseptic larvae to vitamin B, R. P. HOBSON (*Biochem. Jour.*, *27* (*1933*), *No. 6*, *pp. 1899–1909*, *figs. 4*).—The author finds that the larvae of *Lucilia sericata* Meig. the sheep maggot fly, "are unable to develop aseptically on sterile blood owing to lack of growth factors of the vitamin B type; the presence of bacteria improves growth. Aseptic larvae grow at the normal rate on blood supplemented with yeast autolysate. The effect of yeast is due to an 'insoluble' substance and to soluble factors which can be further differentiated by their stability to heat. The insoluble growth factor is present in muscle and yeast and is not extracted by water or alcohol; in autolysed yeast, it is soluble in water, sparingly soluble in alcohol, and insoluble in ether. Peters' antineuritic concentrate supplies an essential heat-labile factor; since concentrates of different purity showed a correlation between growth-promoting effect and antineuritic potency, it is concluded that the active substance is vitamin B_1. Blowfly larvae also require at least two heat-stable growth factors, which are present in autoclaved yeast extract.

"These results support the hypothesis that vitamin synthesis may be the function of the symbiotic micro-organisms present in bloodsucking insects."

The influence of temperature on the activity of sheep-blowflies, A. J. NICHOLSON (*Bul. Ent. Res.*, *25* (*1934*), *No. 1*, *pp. 85–99*, *figs. 8*).—This report of studies of the influence of temperature and humidity upon the activity of sheep blowflies in Australia deals with *Lucilia cuprina* Wied., *L. sericata* Mg., *Chrysomyia rufifacies* Macq., and *Calliphora stygia* Fab.

"With constant temperatures the greatest activity occurs near the center of the temperature range, whereas with rising temperature it immediately precedes the upper thermal death point. Rising temperature causes activity to occur at a lower range of temperatures than does constant temperature. Rising temperature causes the appearance of 'distress activity' at high temperatures, but constant temperature does not. For the development of the necessary energy for full crawling and flight activity at the most favorable temperatures, rather long exposure to these temperatures is necessary. Flight and, to a lesser extent, crawling occur in bursts of activity whether the temperature is rising or constant.

"Differences in the reactions to temperature of the closely related species *L. cuprina* and *L. sericata* are very distinct. The curves for general activity and temperature preference correspond to the known distribution of the four species examined. Frequency of regurgitation is definitely associated with high temperature. There are strong indications that the conditions of the experiment were suitable for the flight of *L. cuprina* but unsuitable for that of the other species examined. This may have been due to the lack of bright sunlight or to the confined space of the observation jars.

"It is shown that activity is a complex phenomenon, and that the character of the results obtained is influenced by the kind of activity examined, by the methods of measurement used, and by the nature of the temperature conditions to which the insects are exposed."

Jetting for the reduction of sheep blowfly attack: The value of certain insoluble arsenicals and other mixtures, R. N. MCCULLOCH (*Agr. Gaz. N.S. Wales*, *43* (*1932*), *No. 8*, *pp. 565–573*, *figs. 8*).—In 1930–32 field trials, "the insoluble calcium arsenite used in suspension in water as a jetting mixture appears to give a somewhat greater degree of protection from blowfly strike than does arsenite of soda solution or the sheep dip used. In 6 of the 7 experi-

ments in which they were compared calcium arsenite showed a moderate or marked superiority, whilst in the seventh it was slightly less effective. In the 1 experiment in which paris green was used the results indicate that it is comparable to calcium arsenite. Here, as in previous tests, it gave promise as a cheap and effective jetting mixture. Further field trials of paris green and calcium arsenite are in hand. Soap or dilute caustic soda as a wetting agent in the mixture reduces the danger of untreated patches occurring in the jetted area. The addition of kaolin to arsenite of soda solution does not increase its efficiency as a jetting mixture. Sodium silicofluoride solutions, as used in these experiments, gave less protection than arsenicals. Melaleuca oil, applied in a jetting mixture containing 1.25 percent oil as a deterrent of strike, proved somewhat less effective than arsenicals as used in the final reduction of strike."

Jetting mixtures for the control of sheep blowfly attack: Experiments carried out during 1932–33, R. N. McCulloch (*Agr. Gaz. N.S. Wales, 44 (1933), No. 10, pp. 766–774*).—In continuing his experiments the author found the calcium arsenite mixture to give considerably better protection from blowfly strike than did the sodium arsenite solution or the sheep dip employed and to be the best mixture thus far tested in the field, thus confirming the findings of the preceding year.

The eggs of four species of fruit flies of the genus Anastrepha, E. W. Emmart (*Ent. Soc. Wash. Proc., 35 (1933), No. 8, pp. 184–191, figs. 2*).—The author here deals with the egg structure and pattern of four species of *Anastrepha* of economic importance in the West Indies and Latin America, namely, the Mexican fruit fly, *A. striata*, the West Indian fruit fly, and *A. serpentina*, which make possible the identification of these species through examination of the eggs alone.

Seasonal incidence and concentrations of sand fly larvae, Culicoides dovei Hall, in salt marshes (Ceratopogoninae: Diptera), J. B. Hull, W. E. Dove, and F. M. Prince (*Jour. Parasitol., 20 (1934), No. 3, pp. 162–172, figs. 7*).—The investigations here reported show that seasonal concentrations of larvae of *C. dovei* occur in wet soil shaded by trees, in ditches, near barriers, and in depressions of salt marshes. The seasonal incidence of larvae in these locations suggests that drainage ditches may either dispatch sand fly larvae to deep water or so concentrate them that during certain seasons they may be destroyed by natural factors or artificial treatments.

The alfalfa weevil or Phytonomus (Phytonomus variabilis Hbst.), V. V. Íakhontov (Yakhontov) (*Listovoĭ lûtsernovyĭ slonik ili Fitonomus (Phytonomus variabilis Hbst.). Moskva (Moscow): Vsesoûzn. Akad. Selsk. Khoz. Nauk Lenina, Sred. Nauch. Issled. Inst. Kloṫsk. [Lenin Acad. Agr. Sci., Sci. Res. Cotton Inst. Middle Asia], 1934, pp. 240, figs. 77; Eng. abs., pp. 217–220*).—An extended report of studies of the alfalfa weevil *P. variabilis*, which causes severe injury every year in nearly all of central Asia. By mass infestation the coefficient of injury of the weevil on the first crop of alfalfa fluctuates between 39.47 and 89.55 and averages 65.35 percent; besides, the pest strongly reduces the food value of the crop. The results of experimental work conducted are reported. The natural enemies most numerous in central Asia include the parasites *Canidia curculionis* Thom., *Dinocampus terminatus* Nees, and *Notaspis oblonga* C. Koch; the predators *Coccinella 7-punctata* L. and *Triphleps albidipennis* Reut.; the birds *Matacilla alba* L. and *M. feldegii* Mich.; and a fungus disease due to *Tharichium phytonomi*.

The account is accompanied by a 14-page list of references to the literature.

The pumpkin beetle Aulacophora hilaris Boisd., W. L. Morgan (*Agr. Gaz. N.S. Wales, 44 (1933), Nos. 11, pp. 811–815, figs. 9; 12, pp. 915–922*).—The

first part of this contribution deals with the economic significance, distribution, and food plants of *A. hilaris*, and describes the structure of the insect in the different stages of its life. The second part gives data on its development and habits and discusses measures for the control of the pest.

Time of turning legumes and planting corn to avoid injury from the southern corn root worm, F. S. Arant (*Alabama Sta. Circ. 65 (1934), pp. 10, figs. 6*).—In continuation of studies of the southern corn rootworm, a detailed account on the life history of which and preliminary data on 3 yr. of control work have been noted (E.S.R., 62, p. 758), the author reports upon the results of 6 yr. of experimental work to determine the best time to turn winter legumes and plant corn in order to avoid serious injury from this rootworm. It is pointed out that adults of this pest congregate and feed on winter legumes in the early spring and that the females deposit their eggs in the soil nearby. "The larvae emerge from the eggs and feed on the roots of the legumes, grasses, or other plants. When corn is grown following the turning of winter legumes, the larvae often attack the seedling plants, boring into the stalks and thereby causing the buds to wilt and die. Several species of insects produce injury similar to that of the southern corn rootworm and are often mistaken for it. Insects commonly mistaken for the southern corn rootworm are the lesser cornstalk borer, the southern (larger) cornstalk borer, the corn ear worm, the sugarcane beetle, wireworms, and white grubs. . . .

"The most serious injury occurred in corn planted following the turning of legumes March 15 and the least injury following the turning April 15. No serious injury occurred to any corn planted at Auburn April 30 or thereafter, following the turning and disking of winter legumes on or before April 15."

The dermestid Trogoderma versicolor Creutzer, a new pest of dried milk products, C. R. Twinn (*Canad. Ent., 66 (1934), No. 3, pp. 49–51*).—This note relates to infestations of dried-milk plants in Ontario by *T. versicolor*. It is pointed out that while the amount of damage caused thus far is comparatively unimportant, the species is potentially dangerous, as indicated by its recorded habits, being of cosmopolitan distribution.

Recent discoveries concerning the biology of the mountain pine beetle and their effect on control in western white pine stands, D. De Leon, W. D. Bedard, and T. T. Terrell (*Jour. Forestry, 32 (1934), No. 4, pp. 430–436, fig. 1*).—Studies of the biology of the mountain pine beetle conducted during 1930, 1931, and 1932 in the white pine stands of eastern Washington and northern Idaho are reported.

An annotated list of the parasites, predators, and other associated fauna of the mountain pine beetle in western white pine and lodgepole pine, D. De Leon (*Canad. Ent., 66 (1934), No. 3, pp. 51–61*).—This is an annotated list of the invertebrate fauna found associated in any way with the brood of the mountain pine beetle during the period that the trees are infested.

Further observations on the pollen constancy of bees, W. H. Brittain and D. E. Newton (*Canad. Jour. Res., 10 (1934), No. 3, pp. 255–263, pl. 1, fig. 1*).—This contribution is in continuation of the authors' studies of the pollen constancy of hive bees and the wild bee visitors to apple blossoms (E.S.R., 70, p. 658). "Only hive bees and various *Andrena* spp. appeared in significant numbers in this study. The latter show a much lower degree of constancy than the former, confirming previous work. The wide difference between the complex of insect pollinators at Macdonald College and that of Kings County, Nova Scotia, is discussed. The highly polytrophic character of the common insect pollinators of the apple is emphasized."

The genera Halictus and Andrena in western Nova Scotia, C. E. Atwood (*Canad. Jour. Res., 10 (1934), No. 2, pp. 199–220, figs. 91*).—The author deals

principally with the classification of the bees of the genera *Halictus* and *Andrena* collected during a 5-year project on the pollination of the apple in the Annapolis-Cornwallis Valley, N.S. Keys for the separation of the species concerned are given, together with figures of the eighth and ninth abdominal sterna of the males, which were found very useful in separating related species. One new species, *A. kalmiae*, and the true male of *A. ceanothi* Vier. are described, and a redescription of *H. arcuatus* Rob. is given, including a summer form which is presumably sterile. The taxonomic section is prefaced by brief notes on economic importance and biology of the genera.

Trichogramma minutum Riley as a parasite of the oriental fruit moth (Laspeyresia molesta Busck) in Ontario, W. E. van Steenburgh (*Canad. Jour. Res., 10 (1934), No. 3, pp. 287–314, figs. 6*).—The author reports upon investigations conducted during the years 1928–33 with the egg parasite *T. minutum*, particular attention being given to its field of usefulness in the biological control of the oriental fruit moth in Ontario.

The author has found the parasite to be of little practical significance in the natural control of the pest in that Province. "Under certain conditions of weather and host abundance, parasitism may be increased materially by the liberation of *Trichogramma* in the orchards, but in general the results are not dependable. A large number of experiments were conducted utilizing three biological races of the species. The technic employed in the work and the results obtained are given, as well as a number of important observations on the habits and biology of the parasite."

The mass rearing of Microbracon brevicornis Wesm., G. C. Ullyett (*So. African Jour. Sci., 30 (1933), pp. 426–432*).—The author here records the methods which have been evolved as a preliminary to further work with *M. brevicornis*, of which the bollworm is the only natural host thus far recorded in the Union of South Africa. The Indian-meal moth has been selected as a laboratory host for mass production of the parasite, methods of rearing of which on a large scale are described together with those used in collecting the larvae. Reference is made to the recent report by Taylor of studies of the bollworm and *M. brevicornis* in the Union of South Africa.

Descriptions of five parasitic Hymenoptera, S. A. Rohwer (*Ent. Soc. Wash. Proc., 36 (1934), No. 2, pp. 43–48*).—*Bruchobius magnus*, parasitizing the pea weevil, broadbean weevil, and *Bruchus cicatricosus* Fahr. in Cape of Good Hope, Union of South Africa; *Catolaccus fragariae*, reared from the strawberry weevil at Knoxville, Tenn.; and *Phanerotoma formosana*, reared from the larva of *Glyphodes pyloalis* Walk., *Rhogas narangae*, reared from the larva of *Naranga aenescens* Moor., and *R. metanastriae*, reared from *Metanastria punctata* Walk., all from Taiwan (Formosa), Japan, are described as new.

Seven new species of reared Braconidae (Hymenoptera), C. F. W. Muesebeck (*Ent. Soc. Wash. Proc., 35 (1933), No. 9, pp. 193–200*).—The species here described as new are as follows: *Apanteles homoeosomae* taken from *Homoeosoma electellum* Hulst in sunflower at Santiago de las Vegas, Cuba; *A. impunctatus* from the sugarcane borer at Jeanerette, La., *A. sorghiellae* from the sorghum webworm at Columbia, Mo.; *A. bushnelli* reared from pine tips infested with *Rhyacionia frustrana bushnelli* Busck at Halsey, Nebr.; *Opius hydrelliae* taken from *Hydrellia scapularis* Loew at Sacramento, Calif.; *Microbracon phyllocnistidis* from *Phyllocnistis citrella* Stain. at Buitenzorg, Java; and *Chelonus* (*Chelonella*) *audeoudiae* reared from *Audeoudia haltica* Meyr. living in the seed capsules of Euphorbiaceae at Ngerengere, Tanganyika.

On the bionomics of a eulophid (Trichospilus pupivora Ferr.), a natural enemy of the coconut caterpillar (Nephantis serinopa Meyr.) in

south India, K. P. Anantanarayanan (*Bul. Ent. Res., 25 (1934), No. 1, pp. 55–61, fig. 1*).—An account of the biology of a serious caterpillar pest of coconut palms both in Ceylon and south India is accompanied by a report of observations of its important natural enemies, particularly the bionomics of the eulopid parasite *T. pupivora*.

ANIMAL PRODUCTION

[Investigations with livestock at the Arkansas Station] (*Arkansas Sta. Bul. 297 (1934), pp. 60, 61, 80, 81, 116*).—In this summary of accomplishments by the station since its establishment, the results of a comparison of alfalfa hay with soybean hay and alfalfa meal with tankage for pork production are briefly reported.

With poultry, results are briefly reported on the use of brewers' rice, rice polish, and rice bran in comparison with standard grains in growing and laying rations, and the influence of minerals, cod-liver oil, germinated oats, and alfalfa leaf meal on production, hatchability, fertility, and egg weight.

[Investigations with livestock in Iowa] (*Iowa Sta. Rpt. 1933, pp. 24–26, 27, 28, 29–34, 37–41, 42, fig. 1*).—Nutrition studies have yielded information on the development and cure of nutritional anemia in lambs, and the effect of diet on the quantity of vitamins A and D occurring in hens' eggs, both by B. H. Thomas.

In studies with beef cattle, results are reported on protein supplements and a simple mineral mixture for fattening calves, by C. C. Culbertson and W. E. Hammond; and influence of sex upon the quality and palatability of beef from calves and yearlings, by M. D. Helser, F. J. Beard, Culbertson, Thomas, J. A. Schulz, and P. M. Nelson.

Swine studies were concerned with the consequences of inbreeding Poland China hogs, by J. L. Lush and Culbertson; outbreeding v. crossbreeding with swine, by P. S. Shearer and Culbertson; the relative efficiency of different sources of calcium for growing and fattening spring pigs in dry lot, and the value of yeast and prepared yeast feeds for fattening pigs on rape pasture, both by Culbertson and Thomas; swine performance record, and the influence of soybeans and soybean products upon the character and quality of fat and lard from swine, both by Culbertson, Helser, Beard, and Thomas; the relative efficiency of different types of corn for growing and fattening pigs, by Culbertson and J. L. Robinson; and efficiency of high- and low-protein supplements for gilts, by Culbertson.

The poultry work included studies on the biological value of meat scrap and milk combinations for egg production, egg yolk and chicken fat as preventives of rickets and slipped tendons of chicks, and comparison of avian embryonic growth rates as measured by nitrogen and ash content, all by E. W. Henderson; association of the date of hatch, date of first egg, and maturity with egg production, and influence of selection and breeding upon egg production and maturity, both by N. F. Waters; the effect of inbreeding, linebreeding, outbreeding, and crossbreeding, by Waters and W. V. Lambert; and the influence of protein levels and calcium and phosphorus balance upon rachitis of chicks, by H. L. Wilcke, Henderson, and C. Murray.

Other studies were concerned with inbreeding and other breeding practices used in producing the pure breeds of livestock, by Lush; and the preparation of roughages for draft colts, by A. B. Caine and Culbertson.

[Investigations with livestock at the Louisiana Station] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 4, 5, 25, 26*).—Brief reports are given of recent investi-

gations on the feeding value of rice bran and the production of soft pork, blackstrap molasses for feeding mules and poultry, shrimp meal for hogs, a comparison of molasses and corn for feeding steers, a survey of wool production in Louisiana, improvement of pastures for beef production, and white clover pastures for swine.

With poultry, results are also briefly reported of investigations on the use of shrimp meal with meat scrap in growing and laying rations, rearing chickens in confinement to control coccidiosis, examinations of eggs failing to hatch, and the use of electric heat in battery brooders.

[Experiments with livestock in New Hampshire] (*New Hampshire Sta. Bul. 280 (1934), pp. 7, 24*).—Results obtained in experiments with livestock are reported on the low protein content of soybean hay and the needs of the horse for more energy-producing feeds in winter, both by E. G. Ritzman and F. G. Benedict, and new findings by A. E. Tepper on vitamin A for chicks.

Utilization of pastures, A. T. Semple and T. E. Woodward (*U.S. Dept. Agr., Misc. Pub. 194 (1934), pp. 44–86, figs. 17*).—Suggestions are given in this section of the handbook (see page 575) for the profitable utilization of pastures in livestock production, with special emphasis on the nutritive values of pasture crops. Directions are also given for the management of pastures suitable for various classes of livestock, including poultry. A section on stock-poisoning plants, by A. B. Clawson, is included.

The calcifying properties of green, artificially dried, and sun-cured pasture herbage, R. E. Hodgson and J. C. Knott (*Jour. Agr. Res. [U.S.], 48 (1934), No. 5, pp. 439–446*).—The results of two experiments are reported from the Washington Experiment Station dealing with the antirachitic potency of green, artificially dried, and sun-cured pasture herbage when fed to rats, employing the methods outlined by Sherman and Stiebeling (E.S.R., 62, p. 494; 64, p. 791).

The grass was fed at levels of 3, 6, and 9 percent of the total dry matter, and there was evidently a sufficient amount of the calcifying factor in the green, artificially dried, or sun-cured grass at the 3-percent level to cause good calcification in the experimental animals. The potency was relatively the same in the three types of grass. It was found that little difference in the results was obtained by the use of the percentage of ash in the green femur bone, the percentage in the same bone after it had been dried, and the ratio of the ash to the organic residue of the femur bone as measures of calcification. These results suggest the high antirachitic value of the pasture grass employed, which was a mixture of English ryegrass, Italian ryegrass, and a small percentage of white clover.

Studies on growth and the antirachitic vitamin, W. F. Dove (*Maine Sta. Bul. 369 (1933), pp. 525–527*).—Data are briefly reported on the nutritive value of Maine fisheries products, the vitamin D value of Maine herring oil, vitamin G in Maine whitefish and sardine meal manufactured by the vacuum process, and Maine fish meal for dairy cattle and swine.

Is there a general deficiency of calcium, iron, and magnesium in Maine soil? W. F. Dove (*Maine Sta. Bul. 369 (1933), p. 528*).—The relationship of mineral deficiencies in the soil to mineral deficiencies in forages and plants grown on the soil and the consequent effects on animals is briefly discussed.

[Studies on the nutritive value of feeds] (*Massachusetts Sta. Bul. 305 (1934), pp. 44, 45, 50*).—Brief reports are given on studies of the nutritive value of fish meals from which the glue has been extracted, by M. M. Cleveland; and the mineral requirements for growing dairy heifers, and the chemical composition of various species of pasture grasses on different soil types, both by J. G. Archibald and E. Bennett.

Tenth annual report [of the] National Live Stock and Meat Board, 1932–33, R. C. POLLOCK (*Natl. Livestock and Meat Bd. Ann. Rpt., 10 (1933), pp. [X]+94, figs. 53*).—This report (E.S.R., 68, p. 230) contains accounts of studies on the quality and palatability of meat, lard investigations, and nutrition research. Brief reports are also made of publicity contests and information on meat disseminated during the year.

Beef cattle investigations, 1933–34 (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1933–34, pp. 8*).—The results of three experiments in the feeding of cattle are reported (E.S.R., 70, p. 221).

The comparative value of whole kafir fodder, ground kafir fodder, and kafir silage as basal winter rations for stock cattle.—Three lots of 10 yearling steers each were employed in comparing rations in which the roughage consisted of whole kafir fodder, ground kafir fodder, or kafir silage fed with 1 lb. of cottonseed cake per head daily. The ground kafir fodder and the kafir silage produced considerably more rapid gains than the whole kafir. The respective gains per acre were 237.4, 303.4, and 162.6 lb.

Will the addition of phosphorus improve silage as a basal winter ration for stock cattle?—Three lots of calves were selected for comparing rations of sorgo silage alone, sorgo silage with monocalcium phosphate, and sorgo silage with cottonseed cake to determine whether the improvement in rations of cottonseed cake resulted from the extra phosphorus supplied or the extra protein. The cottonseed cake group made gains of 1.3 lb. per head daily as compared with 0.8 for the group in which the calcium phosphate supplement was given, and 0.7 for the group on sorgo silage alone, suggesting the importance of the protein.

How much cottonseed cake should be fed when silage is used as the basal winter ration for stock cattle?—In a 150-day test with six lots of calves, different amounts of cottonseed cake were fed as supplements to rations of sorgo silage. Although those receiving 1 lb. of cottonseed cake during the entire period or 0.5 during the first 60 days and 1 lb. during the last 90 days made the most rapid gains, those receiving 0.5 lb. during the entire feeding period or those receiving 1 lb. during the last 90 days did almost as well. It is suggested, therefore, that 0.5 lb. per head daily is sufficient cottonseed cake to feed calves as a supplement to a sorgo silage ration.

Feeding furnishes elements lacking, E. J. MAYNARD (*Cattleman, 20 (1934), No. 12, pp. 19–21, fig. 1*).—In feeding tests at the Utah Experiment Station, steamed bone meal, cottonseed cake, and mill-run bran, respectively, were added as phosphorus supplements to a basal ration made up of wet beet pulp, beet molasses, alfalfa hay, and salt for fattening cattle.

The addition of these supplements eliminated pica, improved the appetite of the cattle, and increased the rate and efficiency of gains. As a result of the use of these supplements there were significant increases in the blood phosphorus of the animals.

Maintaining forage production on the range, C. L. FORSLING (*Natl. Wool Grower, 24 (1934), No. 5, pp. 15–17, 29–32, figs. 6*).—This article discusses the experimental work conducted at the U.S. Sheep Experiment Station, Dubois, Idaho. The relation of rainfall to forage production and the effect of systems of grazing on forage production are brought out by means of graphs.

Pasturage and silage production for sheep, C. E. FLEMING, M. R. MILLER, and A. YOUNG (*Nevada Sta. Rpt. 1933, p. 13, 14*).—Brief reports are given on tests of the resistance to drought of reed canary grass, rotation and deferred grazing of sheep pastures, grass consumption by lambs, and the relative economy of raising twin lambs and singles.

Tests of sheep branding fluids, J. F. Wilson (*Natl. Wool Grower, 24 (1934), No. 4, p. 28.*)—The results of a test to determine the durability and solubility of certain kinds of sheep-marking fluids are reported briefly in this paper from the California Experiment Station.

Seth Adams: A pioneer Ohio shepherd, C. S. Plumb (*Ohio Archaeol. and Hist. Quart., 43 (1934), No. 1, pp. 1–34, fig. 1*).—The importation of Merino sheep by Mr. Adams in 1801 and his subsequent operations in Ohio are discussed in this biographical account.

Hog feeding experiments, F. B. Headley (*Nevada Sta. Rpt. 1933, pp. 23, 24, fig. 1*).—Light, medium, and heavy weight pigs were compared as to the economy of gains produced and feed requirements per unit of gain, an attempt being made to test the relative merits of the Morrison and Evvard standards.

Fresh cut alfalfa for fattening pigs, C. E. Aubel (*Swine World, 21 (1934), No. 7, p. 5*).—At the Kansas Experiment Station a test was conducted to determine the value of alfalfa pasture for self-fed hogs as compared with alfalfa hay for pigs self-fed in dry lot. Corn and tankage were given to two lots of pigs, averaging 85 lb. per head. The lot on pasture made average daily gains of 1.6 lb., while that in dry lot gained 1.4 lb. per head daily. The cost per 100 lb. of gain was $3.57 for dry-lot pigs and $3.23 for pasture-fed pigs. Pigs fed fresh-cut alfalfa twice a week gained 1.4 lb. per head daily at a cost of $3.51 per 100 lb. of gain. On the basis of these results, it is concluded that pasturing alfalfa was the most efficient method, followed by feeding fresh-cut alfalfa twice a week, with alfalfa hay the least efficient.

Soybeans as a part of the protein supplement for growing pigs, E. F. Ferrin (*Swine World, 21 (1934), No. 7, p. 7*).—In tests at the Minnesota Experiment Station, three lots of 10 pigs each averaging 72 lb. per head, were fed for 75 days in dry lot. In the respective lots shelled corn was fed at the rate of 85, 80, and 75 percent of the ration; tankage, 10, 5, and 0; alfalfa meal, 5 percent in all lots; soybeans, 0, 10, 10; and linseed meal, 0, 0, and 10 percent. All lots were self-fed a mineral mixture.

The average daily gains were 1.2, 1.2, and 1.3 lb. per head in the respective lots. Feeding 10 percent of soybeans did not materially increase the rate of gains, and at existing feed prices did not decrease the cost of gains.

A preliminary review of the field of research in eggs and poultry (*Chicago: Inst. Amer. Poultry Indus., 1934, pp. [1]+32+[1], pls. 2, fig. 1; also in U.S. Egg and Poultry Mag., 40 (1934), No. 2, pp. 27–54, fig. 1*).—This is a report prepared under the direction of the National Advisory Committee on Research, summarizing the more urgent problems dealing with eggs and poultry and reviewing the research work being done or needed to solve these problems.

Effects of endocrine extracts on the early development of the chick, W. R. Breneman (*Science, 79 (1934), No. 2054, pp. 434, 435*).—In tests with 568 chick embryos treated mostly with antuitrin-S and theelin, the sexes were found to be 305 females, 170 males, and 93 unknowns. The early mortalities which occurred after sex could be determined were predominantly of female embryos, running as high as 83 percent. Since the extracts have fractions which affect the female reproductive system, the results appeared to be significant.

The vitamin D requirements of growing chicks and laying hens, R. R. Murphy, J. E. Hunter, and H. C. Knandel (*Pennsylvania Sta. Bul. 303 (1934), pp. 24, figs. 11*).—The results of tests are reported in which from 0 to ½ percent of cod-liver oil was added to an all-mash ration for 2,000 Single Comb White Leghorn chicks raised to 24 weeks of age in confinement and for about 500 of the pullets the following year. In addition to the 8 lots in this group

confined to battery brooders, there were 2 lots of birds on range designed to compare the value of no cod-liver oil or ⅛ percent as a supplement to the all-mash ration.

The group of birds receiving no cod-liver oil showed symptoms of rickets at the end of 3.5 weeks and was discontinued at the end of 16 weeks because of the extreme rachitic condition of the individuals. The group receiving $\frac{1}{32}$ percent of cod-liver oil also developed external symptoms of rickets at about 7 weeks of age, but was continued throughout the experiment. The group receiving $\frac{1}{16}$ percent of cod-liver oil showed a slight deviation from normal in the histological picture of the epiphysis of the tibia and a low blood calcium value at 8 and 16 weeks when examined, but its growth curve seemed approximately equivalent to the other lots receiving larger amounts of cod-liver oil throughout the 24-week period. Both lots on range developed normally.

Some birds were continued to 76 weeks of age during production on the same rations. Birds receiving $\frac{1}{16}$ percent or less of cod-liver oil in the mash gave somewhat lower egg production than those receiving larger amounts of cod-liver oil. An allowance of ¼ percent of cod-liver oil, supplying 270 international units of vitamin D per gram, is recommended for laying pullets confined without access to sunlight, to give satisfactory results in maintenance of body weight, egg production, egg size, quality of eggshell, and hatchability. No differences were observed between the groups receiving ⅛ percent of cod-liver oil and those receiving no cod-liver oil on the range.

The all-mash ration fed to the birds consisted of yellow corn, wheat bran, wheat middlings, alfalfa leaf meal, meat scrap, dried milk, ground oats, ground limestone, and salt.

The vitamins A and D activity of egg yolks of different color concentrations, B. Bisbey, V. Appleby, A. Weis, and S. Cover (*Missouri Sta. Res. Bul. 205 (1934), pp. 32, figs. 4*).—Experiments were undertaken to compare the vitamins A and D activity of egg yolks of definite and uniform color concentrations produced by hens under carefully controlled conditions of rations and housing. Determination was made also of the carotene and xanthophyll content of such yolks, using a modification of the method of Schertz (E.S.R., 53, p. 501). There was a distinct gradation of color in yolks from the different rations, while within the same ration the color was quite uniform. The colors of the yolks were classified according to their agreement in color to 10-cc samples of potassium dichromate solutions, each containing 0.1 g of talc.

The results of the vitamin A tests showed that while there was apparently some relationship between color and growth, the vitamin A activity of yolks could not be explained on the basis of the carotenoid pigments they contain. The vitamin A activity of the yolks was directly dependent upon the rations of the hens.

In the vitamin D tests, it was found that the rations used had but little effect upon the deposition of calcium in the bones of experimental rats. There was evidence that the amount of sunshine available for layers made a difference in the vitamin D activity of egg yolks.

Force-molting of hens and all-night lighting as factors in egg production, D. F. King and G. A. Trollope (*Alabama Sta. Circ. 64 (1934), pp. 7, fig. 1*).—The results of two tests are briefly reported involving a comparison of force-molting and all-night lighting with no molting and no lights for hens.

The results showed that the force-molted hens had a lower mortality, produced more eggs, and gave a larger return above feed cost than the birds in the control pen in both years. Hatchability was slightly lower in the lighted

pen each year. Directions are also given for the management of birds with this method of lighting.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle at the Arkansas Station] (*Arkansas Sta. Bul. 297 (1934), pp. 59, 60, 78, 79*).—The results are briefly reported of studies by the station since its establishment of the comparative value of mung bean hay, cowpea hay, soybean hay, and Korean lespedeza hay with alfalfa for milk production; and the feeding value of rice meal v. corn chops, rice bran v. wheat bran, and rice polish v. yellow corn chops for milk production.

[Investigations with dairy cattle and dairy products in Iowa] (*Iowa Sta. Rpt. 1933, pp. 24, 26, 27, 34–37, 61–67, fig. 1*).—Dairy cattle studies report data on the consequences of inbreeding in Holstein-Friesian cattle, by J. L. Lush and C. Y. Cannon; persistency and inheritance of milk and fat production among cows in Iowa cow-testing association herds, by Lush and G. G. Gibson; relation of vitamin E to sterility in dairy cows, by Cannon, B. H. Thomas, and D. L. Espe; relation of blood calcium to blood phosphorus in sterility of dairy animals, by Cannon, J. A. Schulz, and Espe; normal values for calcium and phosphorus in skeletal tissue of dairy calves, by Cannon, Espe, E. N. Hansen, and L. Yoder; influence of the physical properties of milk on its rate of digestion in vivo, by Cannon and Espe; and comparative efficiencies of a modified ensilage cutter and a hay fork for storing hay, by Cannon, Hansen, and E. V. Collins.

The results of investigations on the manufacture of dairy products and the handling of market milk are briefly reported on the influence of diet on the antirachitic potency of cow's milk, by Thomas and Cannon; the influence of the acidity in cream on fat losses in buttermilk, and the kinds of acids in butter and the distribution of these acids between the water and fat phases of butter, both by E. W. Bird; the significance of numbers and of morphologic types of bacteria in butter from the standpoint of its keeping quality, *Pseudomonas fragi* causing rancidity in butter, microorganisms causing surface taint in butter, the germicidal property of milk, Iowa milk plants—contamination following pasteurization, classification of the organisms important in dairy products, products formed by *Streptococcus citrovorus* and *S. paracitrovorus* from citric acid and from lactic acid, methods of preparing butter cultures for mail shipment, the type and sources of the "pin point" bacteria in ice cream, the formulation of a bacterial standard for Iowa ice cream, and the importance of acetylmethyl carbinol and diacetyl in butter cultures, all by B. W. Hammer.

[Investigations with dairy cattle at the Louisiana Station] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 17, 18*).—Brief reports are given of the results of recent pasture studies with dairy cattle on the feeding value of grass hay, the feed costs of raising heifers, comparison of winter pasture with no pasture for milk cows at the North Louisiana Substation returns from pastures for Jerseys, and the value of fertilizers added to permanent pastures for milk production.

Feeding dairy cattle, C. B. Bender (*New Jersey Stas. Circ. 302 (1934), pp. 27, figs. 3*).—This circular supersedes Bulletin 438 (E.S.R., 57, p. 868).

A test of the economic efficiency of alfalfa hay as a sole ration for dairy cattle, and its relation to sterility, F. B. Headley (*Nevada Sta. Rpt. 1933, pp. 21–23, fig. 1*).—The results of this investigation are cited in continuation of those previously noted (E.S.R., 67, p. 448).

Green pigeon pea tops with attached pods v. green alfalfa for dairy cows (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 4 (1934), pp. 9*).—The results of two double reversal experiments showed that green pigeonpea pods with attached tops were approximately equal in feeding value to green alfalfa for milk production. Green pigeonpea pods were not so palatable as green alfalfa, hence less of the former were consumed, but the milk production was approximately the same.

Pineapple plants as forage for cattle, L. A. HENKE (*Hawaii Sta., Anim Husb. Div. Prog. Notes No. 6 (1934), pp. 8*).—Data are given on the composition of pineapple plants. The results of three feeding tests with Holstein heifers are presented, which demonstrate that pineapple plants can be used to advantage as emergency feeds. Good quality concentrates are necessary, however, if satisfactory gains in live weight are to be obtained.

[Experiments with dairy products by the Massachusetts Station] (*Massachusetts Sta. Bul. 305 (1934), pp. 17, 26–28*).—Brief accounts are given of experiments dealing with a comparison of Devereux "yeast extract" agar and standard agar for plating milk samples and incubation temperatures, by R. L. France; the effect of aging temperature on the bacterial count of ice cream mixes, by W. S. Mueller and France; the influence of percentage of fat, temperature, aging, and delayed cooling on the properties of whipped cream, by Mueller, M. J. Mack, and H. G. Lindquist; the prevention of excessive viscosity in the improvement of ice creams high in fat content, by Mack; the vitamin C content of fresh and frozen strawberries and strawberry ice cream, by C. R. Fellers and Mack; and the comparative efficiency of electrically operated tanks v. ice in the cooling of milk, by J. H. Frandsen.

Questions and answers on incubation of agar plates in milk analysis, M. W. YALE, C. S. PEDERSON, and R. S. BREED (*New York State Sta. Circ. 143 (1934), pp. 12*).—This circular gives essential instructions on the incubation of agar plates in making bacterial counts in milk samples.

[The colon test of milk] (*New Hampshire Sta. Bul. 280 (1934), p. 22*).—This test was found by H. C. Moore not to be an adequate substitute for the inspection of dairy farms.

Pasteurized milk flavor and creaming power as affected by heating medium temperatures and pasteurizer linings, J. C. MARQUARDT and A. C. DAHLBERG (*New York State Sta. Tech. Bul. 223 (1934), pp. 19, figs. 2*).—In studying the influence of pasteurizing temperatures and pasteurization equipment on the development of off flavors and impairment of creaming qualities, tests were conducted in a glass-lined vat pasteurizer and a steel-lined vat pasteurizer employing heating media of water at 180°, 200°, and 210° F. and steam at 210° and 220°. The pasteurizing temperature was 143.5° for 30 min. Agitators were run at the rate of from 56 to 172 r.p.m. Comparable tests were also conducted on a spray-type vat which was steel lined.

The results showed that milk could be pasteurized in a glass-lined vat with the heating media of water as high as 210° or steam at 220° without imparting a cooked flavor to the milk, but in the stainless steel-lined vat water heated only as high as 200° could be employed without producing a cooked flavor. Milk of a high and low sanitary quality responded similarly. The temperatures of the heating medium had no influence on the creaming ability. The cooling medium used, however, had some influence on the development of pasteurized flavors. Vat cooling to 123° or 113° seemed to have an advantage over vat cooling to 133°. Heating milk in glass-lined pasteurizers to as high as 170° for 1 min. did not develop cooked flavors in any of the samples, suggesting that milk will withstand more severe temperatures without developing

cooked flavors than is generally supposed. It was also found that cooked flavors tend to leave milk on aging.

Investigations to test bacteriologically and chemically the effect of cold storage on the keeping qualities of Irish Free State creamery butter, P. S. Arup and G. van B. Gilmour (*[Irish Free State] Dept. Agr. Jour., 31 (1932), No. 2, pp. 179–189; 32 (1933), No. 2, pp. 257–272*).—The Butter Testing Station, Baile Atha Cliath (Dublin), analyzed 72 samples of Irish Free State creamery butter for curd, iron, and copper contents, and for acidity, water, and salt percentages. The results were analyzed in relation to scores for flavor both before and after storage for 6 mo.

Samples having a high curd content or a high percentage of acidity did not keep so well as samples low in these respects. There was not sufficient iron and copper found in these samples to affect their keeping qualities.

The curd and acidity analyses were compared with similar analyses on Irish factory and Danish butter, and the differences are discussed.

In the second phase of this series of studies, 72 samples of butter selected during the months of August, September, and October were stored for 6 mo. in three lots of 24 samples each at temperatures of −2°, −6°, and −12° C., respectively. Bacterial and chemical analyses were made before and after storing.

It was found that the growth of micro-organisms was stopped at all temperatures used. Yeast counts of samples stored at −2° indicated little mortality, but at the lowest temperatures there was a marked reduction in counts. Many butters showed no mold contamination, and counts indicated little or no growth at −2° or −6° and a reduction at −12°. At the temperatures used bacterial counts were reduced. The catalase activity of the butters was slight and was reduced by cold storage. The pH of the samples varied from 6.2 to 7.4, and it did not change appreciably during storage. No relationship could be established between yeast, mold, and bacterial counts or the catalase numbers and the keeping qualities. Butters with a pH below 6.7 did not keep well in cold storage.

The chemical examinations showed that samples with low curd percentages, titratable acidity, and air content kept better on the average than samples showing high contents, respectively. The pH determination was of more general application in determining keeping quality than the other tests.

Rate of growth of micro-organisms in Irish Free State creamery butter, G. van B. Gilmour and G. Cruess-Callaghan (*[Irish Free State] Dept. Agr. Jour., 31 (1932), No. 2, pp. 226–231*).—In two experiments at the Butter Testing Station, Baile Atha Cliath (Dublin), it was found that the rate of growth of yeast in fresh cream butters was little influenced by the salt content or the acidity. Yeast growth was more rapid as the temperature rose from 0° to 20° C., but at −7° growth stopped. When kept at ordinary temperatures for 1 mo., the yeasts present in freshly churned butter could increase as much as 50,000 percent. Bacteria sometimes developed quite rapidly in fresh cream butter at temperatures about 10°, and the growth was more rapid in the samples of low salt content than in samples of high content. There was no relation between acidity and rate of growth of bacteria. Mold growth was slow in fresh cream butters.

The relationship of the results obtained with experimental butters to conditions existing in ordinary stored butter is discussed.

The bearing of hydrogen ion concentration on the flavour of Irish Free State creamery butter, G. van B. Gilmour (*[Irish Free State] Dept. Agr. Jour., 32 (1933), No. 2, pp. 273–276*).—During the period from August to

November 1932 the Butter Testing Station, Baile Atha Cliath (Dublin), examined 1,292 samples of butter for pH and flavor score. The maximum score allowed for flavor was 180.

The variation in pH ranged from 5.7 to 7.7 with an average of 6.98, while the flavor scores varied from 148 to 174 with an average of 169.72. There was a decided tendency for the flavor score to decrease as the acidity increased. On the basis of these results it is recommended that the pH values of fresh cream butters should be controlled.

VETERINARY MEDICINE

[Report of work with livestock diseases at the Arkansas Station, 1887–1933] (*Arkansas Sta. Bul. 297 (1934), pp. 114–116*).—The work referred to includes that with tuberculosis, Texas fever, forage poisoning, anthrax, and hog cholera.

[Report of work in animal pathology at the Iowa Station] (*Iowa Sta. Rpt. 1933, pp. 41, 42, 114, 115*).—The work in animal pathology under way during the year, here briefly referred to, includes that with infectious laryngotracheitis of chickens, by F. D. Patterson and H. L. Wilcke; so-called range paralysis in chickens and transmission of so-called range paralysis in chickens through the egg, both by C. Murray and associates; breeding for resistance to fowl typhoid in poultry, by W. V. Lambert and N. F. Waters; and genetic investigation of resistance and susceptibility to disease in laboratory animals, by Lambert, the latter being based upon work with mouse typhoid bacteria (*Salmonella aertrycke*).

[Report of work in animal pathology and parasitology at the Louisiana Station] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 8, 9, 20–22*).—Brief reference is made to the value of controlling parasites in horses and mules in Louisiana, control of anthrax by annual vaccination, and investigation of avian coccidiosis, a report of which latter work has been noted (E.S.R., 71, p. 394). See also articles noted on page 539.

[Report of work in animal pathology by the Massachusetts Station] (*Massachusetts Sta. Bul. 305 (1934), pp. 56–59*).—Included in this account of the work of the year are findings under the poultry disease elimination law and routine examinations, pullorum disease investigations, including (1) cause of doubtful reactions, (2) infectivity of droppings, and (3) viability of *Salmonella pullorum*, both by H. Van Roekel and associates; and infectious laryngotracheitis field experiments, distribution and epizootiology studies of infectious laryngotracheitis, the desiccation and preservation of infectious laryngotracheitis virus, and acute avian paralysis or neurolymphomatosis, all by C. S. Gibbs.

[Report of work in animal pathology at the Nevada Station] (*Nevada Sta. Rpt. 1933, pp. 10–13, 16, 17, 18, 25–33, figs. 3*).—A report of the progress of work under way, including the effect on livestock of *Hymenoxis lemmoni*, Russian-thistle, arrowgrass (*Triglochin maritima*), western goldenrod (*Solidago spectabilis*), wild tobacco (*Nicotiana attenuata*), whitetop (*Lepidium draba*), lupines, and plants causing big head in sheep, by C. E. Fleming, M. R. Miller, L. R. Vawter, and A. Young; and hemorrhagic disease, lymphangitis, and avian tuberculosis in cattle, and encephalomyelitis of equines, all by E. Records and Vawter.

[Report of work in New Hampshire in avian pathology and infectious abortion] (*New Hampshire Sta. Bul. 280 (1934), pp. 22–24, 25–27*).—Referring to the work of the year (E.S.R., 69, p. 420), reference is made to the new

poultry disease known as epidemic tremor or trembling chick disease, which in some cases may have been confused with the so-called "crazy chick" disease, by E. E. Jones of the Harvard Medical School and C. A. Bottorff, T. B. Charles, C. L. Martin, F. D. Reed, A. E. Tepper, and S. R. Shimer; adult mortality in poultry and fowl pox increase, both by Martin and Bottorff; pullorum disease controlled by short interval testing and the rapid whole-blood and the standard tube tests for pullorum disease compared, both by Bottorff; inoculation not practical for coccidiosis, by Martin, Bottorff, and Charles; the results obtained in control studies of infectious abortion, by Martin; the testing of one-fifth of the poultry population of the State for pullorum infection, by Bottorff; and results of autopsies of over 3,000 head of poultry, by Martin and Bottorff.

[Contributions on animal pathology] (*N.Y. State Assoc. Dairy and Milk Insp., Ann. Rpts., 6 (1932), pp. 63–107; 7 (1933), pp. 83–86, 125–134, 172–192*).—The contributions presented at the sixth annual meeting, held in Rochester in 1932, include the following: The Laboratory Examination of Milk in the Detection and Control of Mastitis, by G. J. Hucker (pp. 63, 65–75); The Physical Examination in the Diagnosis and Control of Mastitis, by D. H. Udall (pp. 77–83); Problems of Administration in the Eradication of Cattle Disease, by J. G. Wills (pp. 84–88); and Mastitis—I, Recent Observations in the Practical Application of Both Laboratory and Clinical Methods, by H. G. Hodges (pp. 89–97), and II, Recent Observations in the Practical Application of Both Laboratory [and] Clinical Methods, by J. H. Hewitt (pp. 98–102), with a general discussion of mastitis led by F. W. Graves (pp. 103–106) and C. Ross (p. 107).

Those presented at the seventh annual meeting at Albany in 1933 are The Growth of Pathogenic Bacteria in Milk in Relation to the Degree of Cooling, by A. M. Wahby and J. M. Sherman (pp. 83, 85, 86); Control of Milk-Borne Communicable Diseases, by H. F. Senftner (pp. 125, 127–134); Recent Observations on Mastitis, by H. McDonald (pp. 172–177); Recent Observations on Mastitis, by H. G. Hodges (pp. 178–183); and Some Regulatory Problems to be Encountered in Eradicating Mastitis, by H. E. Bremer (pp. 184–189), with a discussion by J. Wills (pp. 190–192).

Diseases of animals: Prevention and treatment, F. C. Minett (*Jour. Roy. Agr. Soc. England, 94 (1933), pp. 222–246*).—This contribution deals with foot-and-mouth disease, swine influenza, and infectious abortion of cattle.

[Contributions on diseases and parasites of animals and their control in the Union of South Africa] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 2 (1934), No. 1, pp. 33–37, figs. 2; 41–99, figs. 64; 231–298, figs. 7*).—Among the contributions here presented (E.S.R., 70, p. 828) are the following: The Liquefaction of Inspissated Serum by the "Lamb Dysentery Bacillus", by J. H. Mason (pp. 33–37); Descriptions of New Species [*Bovicola pelea, B. hilli, Tricholipeurus elongatus, Linognathus lewisi*, and *Haemodipsus africanus*] of Anoplura Parasitic on Antelopes and a Hare (pp. 41–48) and South African Ticks, I (pp. 49–99), both by G. A. H. Bedford; Researches into Dips and Dipping—A, Lime-Sulphur Dips, Paper IV, Further Studies on the Colorimetric Method as a Rapid Means of Control of Polysulphide Solutions, by T. J. Wilken-Jorden (pp. 231–237) (E.S.R., 69, p. 421), Paper V, the Minimum Effective Concentration of Lime-Sulphur Dips for Sheep Scab Eradication, by G. A. H. Bedford and J. T. Wilken-Jorden (pp. 239–241), and Paper VI, A Survey of the Behaviour of Lime-Sulphur Dips under Field Conditions, by H. A. Hambrock, T. J. Wilken-Jorden, and H. Graf (pp. 243–266), Researches into Dips and Dipping—C, Miscellaneous: The Effect of Dosing Aloes to Tick-Infested Cattle, by G. A. H. Bedford and T. J. Wilken-Jorden (pp. 267–269),

and D, Effects of Dips on Wool, Paper I, The Effect of Arsenical Dips on Wool, by H. A. Hambrock and T. J. Wilken-Jorden (pp. 271–298).

Annual report of the Imperial Institute of Veterinary Research, Muktesar, for the year ending 31st March 1933, F. WARE ET AL. (*Imp. Inst. Vet. Res., Muktesar [India], Ann. Rpt., 1933, pp. II+56*).—Included in this report (E.S.R., 71, p. 96), following that of the director (pp. 1–12), are accounts of the section of pathology, by S. C. A. Datta (pp. 13–19); serology, by J. R. Haddow (pp. 20–26); protozoology and entomology, by S. K. Sen (pp. 27–36); and of the Imperial Veterinary Serum Institute, Izatnagar, by J. D'Costa (pp. 37–42).

Annual report of the Mysore Serum Institute, Bangalore, for the year 1932–33, S. D. ACHAR (*Mysore Serum Inst. Ann. Rpt., 1933, pp. [2]+15*).—The control work of the year with infectious diseases of livestock in Mysore is reported, details of the serum work being presented in tabular form.

Animal health investigations, G. A. JULIUS ET AL. (*Aust. Council Sci. and Indus. Res. Ann. Rpt., 7 (1933), pp. 31–38*).—The occurrence of and activities of the year with the more important infectious and parasitic diseases of livestock are dealt with (E.S.R., 68, p. 667).

Some cellular bases for immune reactions in parasitic infections, W. H. TALIAFERRO (*Jour. Parasitol., 20 (1934), No. 3, pp. 149–161*).—This is the presidential address presented before the American Society of Parasitologists in December 1933.

The immunizing power of bee venom against scorpion venom [trans. title], E. and A. SERGENT (*Arch. Inst. Pasteur Algérie, 11 (1933), No. 4, pp. 588–597*).—In experiments with mice the subcutaneous injection of bee venom gave a feeble immunity against the venom of the scorpion *Buthus occitanus* injected subcutaneously in 12 of 20 cases tested, death having been retarded from a few hours to as long as 10 days, as compared with death of all the check animals (33) in 2 hr. In the case of 12 guinea pigs tested the bee venom did not give any protection against scorpion venom.

The toxicology of plants in South Africa, together with a consideration of poisonous foodstuffs and fungi, D. G. STEYN (*[Johannesburg]: Central News Agency, 1934, pp. XII+631, figs. 135*).—The first part of this work deals with the subject in 23 chapters (pp. 1–73). This is followed by a presentation of the special toxicology of plants (pp. 74–575) under the heads of poisonous foodstuffs, photosensitization, food rashes, fungi in relation to health in man and animal, and poisonous plants. A 29-page list of references to the literature (pp. 576–604), an addendum (pp. 605–607), and an index (pp. 609–631) are included.

Factors concerned in the determination of toxicity of plants, D. G. STEYN (*So. African Jour. Sci., 30 (1933), pp. 483–502*).—This contribution, the first part of which deals with the plant (pp. 483–489) and the second with the animal (pp. 489–500), is presented in connection with a list of 50 references to the literature.

Brucellosis: A public health problem, W. GILTNER (*Michigan Sta. Mem. 1 (1934), pp. 118, figs. 3*).—This monographic account, presented in connection with a list of 209 references to the literature, is divided into five parts as follows: (1) The introduction (pp. 5–13), (2) the problem (pp. 13–51), (3) the solution (pp. 52–103), (4) the summary (pp. 103–106), and (5) the conclusions (p. 106).

The distribution of Brucella abortus in the infected udder, R. THOMPSON (*Canad. Pub. Health Jour., 25 (1934), No. 5, pp. 229–233*).—From the work here reported, it is concluded that in examining milk for the detection of *B. abortus*

the milk from each quarter of the udder should be examined separately. "*B. abortus* is continuously excreted with the milk from infected quarters except when other infections intervene. There is a tendency for *B. abortus* to localize in the right hind quarter of the udder. *B. abortus* is absent when clinical symptoms of mastitis are present in a quarter."

Undulant fever due to Brucella of the porcine type—Brucella suis: Report of a milk-borne epidemic, C. P. Beattie and R. M. Rice (*Jour. Amer. Med. Assoc., 102 (1934), No. 20, pp. 1670–1674*).—In a milk-borne epidemic of undulant fever in Council Bluffs, Iowa, in which 30 cases occurred, 27 of the patients were found to have obtained their milk from the same dairy. "The dairy, from a herd of 20 cows, supplied approximately 80 households; in 18 of these, cases of undulant fever developed. *B. suis* was obtained in blood cultures from 6 of 14 patients and from the milk of 1 of the cows in the herd. The epidemic ceased 13 days after the stoppage of the sale of milk from the dairy."

The haemolytic and toxic activities of filtrates of Clostridium chauvoei, J. C. Kerrin (*Jour. Path. and Bact., 38 (1934), No. 2, pp. 219–229*).—This account of studies of *C. chauvei*, reported in part in tabular form, is presented in connection with a list of 19 references to the literature.

The effect of ferric chloride on the toxicity of Clostridium oedematiens, C. E. Eales (*Aust. Vet. Jour., 10 (1934), No. 1, pp. 25, 26*).—The experiments briefly reported indicate that the toxicity of strains of *C. oedematiens* studied was decreased by several passages through media containing ferric chloride.

Louping ill in man, T. M. Rivers and F. F. Schwentker (*Jour. Expt. Med., 59 (1934), No. 5, pp. 669–685, figs. 3*).—The authors report four instances of infection in man with what is believed to represent cases of louping ill, a natural disease of sheep occurring in Scotland and in the northern part of England due to a filtrable virus.

Characteristics of the piroplasms Babesia argentina and B. bigemina *in the United States*, C. W. Rees (*Jour. Agr. Res. [U.S.], 48 (1934), No. 5, pp. 427–438, figs. 3*).—This is the report of an investigation conducted with a view to determining the species of *Babesia* that occur in the United States, their morphological and physiological characters, and if there be a variation in their reaction to trypan blue. The study of the piroplasms occurring in Europe, Africa, and North and South America has led the author to accept the views of several workers (Wenyon, Reichenow) that the generic name *Babesia* of Starcovici, 1893, holds by priority and that *Piroplasma* Patton, 1895; *Nicollia* Nuttall, 1908; *Nuttallia* França, 1909; *Smithia* França, 1909; *Rossiella* Nuttall, 1912; *Microbabesia* Sohns, 1918; *Babesiella* Mesnil, 1919; and *Françaiella* Yakimoff, 1926, are synonyms. Under these names are reported parasites of bovines, ovines, equines, canines, and rodents. The occurrence in Argentina of two species of *Babesia*, *B. bigemina* and *B. argentina*, was first reported by Lignières in 1903. The author is led to conclude that the piroplasms that were described and illustrated by Smith and Kilborne in 1893 (E.S.R., 4, p. 755) included *B. argentina* Lignières, 1903, as well as *B. bigemina*, although these authors did not differentiate the two species.

"The mean length of a Texas strain of *B. bigemina* was $4.02\pm0.04\mu$ and that of an Argentine strain was $5.00\pm0.05\mu$; the mean lengths of a Louisiana strain and an Argentine strain of *B. argentina* were $3.14\pm0.04\mu$ and $2.82\pm0.07\mu$; respectively; that of an Algerian strain of *B. berbera* was $2.89\pm0.06\mu$; and that of a German strain of *B. bovis* was $2.26\pm0.04\mu$.

"*B. bigemina* and *B. argentina* in the peripheral blood were larger than in the heart blood, but the difference in each case was smaller than 1μ and less than that shown between peripheral blood forms and heart forms in the

figures of Smith and Kilborne. The magnitude of the mean angle formed by the intraglobular couple in piroplasms was as follows: (1) Argentine strain of *B. bigemina* 32.8°, (2) Texas strain of *B. bigemina* 57°, (3) Argentine strain of *B. argentina* (syn., *Babesiella minor*) 123.2°, (4) Louisiana strain of *B. argentina* 109.9°, (5) Algerian strain of *B. berbera* 93.3°, and (6) German strain of *B. bovis* 136.4°.

"The writer's drawings of *B. bigemina* show this piroplasm in the heart blood with only one mass of chromatin, but in the peripheral blood with more than one mass. Spindle-shaped forms have been shown in the present paper to characterize *B. argentina* and not *B. bigemina*, contrary to the findings of Smith and Kilborne. No significant morphological differences were detected between *B. argentina* and *B. berbera*, nor between a Louisiana strain and an Argentine strain of *B. argentina* (syn. *Babesiella minor*), but *B. bovis* was distinguishable from both of the above-named species by its smaller size and its marginal position within the erythrocyte.

"*B. argentina* was cultivated for 96 hr. in vitro; *B. bigemina* could not be cultivated. In agreement with the results of previous investigators, it was found that *B. bigemina* was killed by intravenous injections of trypan blue, but *B. argentina* was not demonstrably affected."

A list is given of 19 references to the literature.

Algerian piroplasmoses and gonacrine [trans. title], L. Rampon (*Arch. Inst. Pasteur Algérie, 11 (1933), No. 4, pp. 570–587*).—In the course of experimental treatment of Algerian piroplasmoses by administration of gonacrine, the author found this medicament to be specific in the case of the common bovine piroplasmosis due to *Piroplasma bigeminum*, babesiellosis due to *Babesiella berbera*, common equine piroplasmosis due to *P. caballi*, and nuttallosis due to *Nuttallia equi*.

Relapsing fever in Texas, II, III, H. A. Kemp, W. H. Moursund, and H. E. Wright (*Amer. Jour. Trop. Med., 14 (1934), No. 2, pp. 159–162; 163–179, figs. 2*).—In the second contribution (E.S.R., 70, p. 69) the authors report that there is a strict adaptation between the spirochete of relapsing fever in Texas, described by Brumpt as *Spirochaeta turicatae* n.sp. (E.S.R., 70, p. 218), and its tick host, in that *Ornithodoros turicata* does not transmit *Borrelia novyi*, *B. kochi*, *B. duttoni*, or *B. obermeieri* in feeding experiments, nor do these organisms remain viable in this tick over a period of one week.

In the third contribution the authors report on the morphology and biological characteristics of the Texas organism described by Brumpt, together with its pathogenicity for laboratory animals. A list of 18 references to the literature is included.

Dried rinderpest vaccine, M. M. Robles and J. D. Generoso (*Philippine Jour. Anim. Indus., [1] (1934), No. 1, pp. 33–43, pls. 2, figs. 4*).—Further experimental work (E.S.R., 68, p. 378) here reported shows that dried rinderpest vaccine derived from the spleen and lymph glands of infected animals was highly protective against artificial virus inoculation in the dosage of 0.5 to 1 g for cattle and 1 to 2 g for carabao. "Of the 20 cattle used 19 or 95 percent were adequately protected, and of the 24 carabao used 20 or 83 percent were similarly protected. Vaccines kept in the ice chest for not more than 27 mo. or exposed to ordinary room temperature for not more than 30 days retained their full immunizing value. Those exposed to the mail for 21 days or to 37.5° C. for 14 days appeared to have slightly lost some of their protective value. Vaccines kept in the ice chest for 36 mo. and those exposed to the mail for 29 days or to room temperature for more than 30 days deteriorated greatly in their immunizing power. A temperature of 55° allowed to act for 5 consecutive hours destroyed the protective value of the vaccine.

"Field and laboratory tests have shown that dried rinderpest vaccine possesses high immunizing properties and is safe to use."

The differentiation of hemolytic streptococci of human and animal origin by group precipitin tests, P. R. EDWARDS (*Jour. Bact., 27 (1934), No. 5, pp. 527–534*).—In work at the Kentucky Experiment Station the author found it possible "to differentiate hemolytic streptococci of human and animal origin by the precipitin test when acid extracts of the organism were used as antigens. *Streptococcus equi*, type A animal streptococci, and type B animal streptococci all belong to the same serological group. Streptococci of human origin constitute a second group. No cross reactions occurred between the two groups."

A note on the hydrolysis of sodium hippurate by hemolytic streptococci, P. R. EDWARDS and R. BROH-KAHN (*Jour. Bact., 27 (1934), No. 5, pp. 535–538*).—In work at the Kentucky Experiment Station 35 strains of low-acid-producing, hemolytic streptococci from horses, cows, chickens, hogs, and guinea pigs, and 19 strains of human origin were tested for their ability to hydrolyze sodium hippurate. The majority were isolated from horses and correspond to the *Streptococcus abortus-equi* and *S. pyogenes-equi* of Klimmer and Haupt. Five of the animal strains and 3 of the human cultures gave evidence of having hydrolyzed very slight amounts of hippurate. "The statement of Klimmer and Haupt that the sorbitol-fermenting streptococci of horses constantly hydrolyze sodium hippurate could not be confirmed."

A serological differentiation of specific types of bovine hemolytic streptococci (group B), R. C. LANCEFIELD (*Jour. Expt. Med., 59 (1934), No. 4, pp. 441–458*).—"In the studies conducted, hemolytic streptococci of group B, derived chiefly from cattle, have been further subdivided by use of the pricip.tin reaction into specific types (E.S.R., 69, p. 581). "With three exceptions, the 21 strains of group B were differentiated into three specific types. Chemical analyses of the type-specific substances of group B strains of types I and II show that they are polysaccharides (S substances). This is in contrast to the fact that proteins (M substances) were previously shown to determine type specificity among strains of human origin (group A). The group-specific substance, C, serologically identical in all members of group B, was also identified as of polysaccharide nature."

An unsuccessful effort to incriminate dairy goats in the transmission of undulant fever in Colorado, R. LEARMONTH and I. C. HALL (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 915–917*).—In an investigation of the possible *Bacterium melitensis* infection of goats in the vicinity of Denver, Colo., blood samples were secured from 70 goats in 8 different herds and milk samples only from 128 animals. Both blood and milk samples were tested from 39 goats and blood-serum tests only on 31.

None of the samples of milk serum agglutinated either antigen at any dilution of serum and only one of the blood serums gave a somewhat questionable reaction at 1:20, this latter animal having been sold out of the city before a second sample could be secured. Thus no evidence has been obtained that goats harbor *B. melitensis* infection in or near Denver. "We feel, however, from our subsequent comparison of blood serums with milk serums in cows, as well as from a study of the literature, that milk serums are less satisfactory for agglutination tests than blood serums, and that final judgment regarding goats should be reserved until more blood samples have been examined."

A list is given of 17 references to the literature.

Studies in immunity to trypanosomes.—I, Acquired immunity in Trypanosoma equiperdum infected rats: The Rieckenberg reaction, S. RAFFEL (*Amer. Jour. Hyg., 19 (1934), No. 2, pp. 416–448, figs. 4*).—The author

obtained an acute blood infection in rats with ordinary heavy infective doses of *T. equiperdum*. The account is accompanied by a list of 43 references to the literature.

With small infective doses of organisms the rat may show an immunity to the parasites. The immunity is strictly strain specific. Subinfective doses of living trypanosomes do not cause the production of immunity in this animal. Investigation of the Rieckenberg or "thrombocytobarin" antibody has revealed it to be associated with the globulin fraction of the serum.

The American dog tick (Dermacentor variabilis) as a host of Bacterium tularense, C. B. Philip and W. L. Jellison (*Pub. Health Rpts.* [*U.S.*], *49* (*1934*), *No. 12, pp. 386–392*).—In experimental work the American dog tick was infected with *B. tularense* in both the adult and larval stages. Larvae from such infected adults fatally infected a white-footed mouse. Additional evidence of a generation to generation continuity of *B. tularense* in this tick was secured by the injection of partial batches of eggs from two additional infected ticks. Nymphs reared from infected larvae produced fatal infections in two guinea pigs. Infection was produced by resultant adults in separate guinea pigs both by feeding and by injection.

"Tests with this and other species of ticks (to be reported) suggest that *B. tularense* is not entirely adapted to continued residence in ticks through their developmental cycle, since the ticks themselves sometimes die (apparently as a result of the presence of this organism) while still attached to the host animal and occasionally without infecting such host. Since (1) larval-to-adult and adult-to-progeny continuity of infection has been demonstrated, (2) recovery of infected ticks in nature has been reported, and (3) cases of human infection apparently associated with bites of this species have occurred, *D. variabilis* must be kept in mind as a possible source of human infection, especially where case histories fail to show evidence of animal contacts."

Comparative experiments on spotted fever and boutonneuse fever, I, G. E. Davis and R. R. Parker (*Pub. Health Rpts.* [*U.S.*], *49* (*1934*), *No. 13, pp. 423–428, figs. 2*).—In experimental work with two tick-transmitted diseases, the vaccine of Rocky Mountain spotted fever afforded complete protection against the virus of spotted fever in guinea pigs, but gave no protection against the virus of boutonneuse fever.

Suitability of Herrold's egg yolk agar medium for isolation of the bovine tubercle bacillus, W. H. Feldman (*Jour. Infect. Diseases*, *54* (*1934*), *No. 2, pp. 194–203*).—In the course of a study made to determine the suitability of Herrold's egg yolk agar medium for isolation and subsequent growth of the organism of bovine tuberculosis, 63 of 71 lymph nodes obtained from cattle which were killed on account of having reacted positively to tuberculin eventually proved to be tuberculous by inoculation of guinea pigs. Acidfast bacillary forms were present in 55 of the direct smears made from 70 of the specimens. Emulsions were prepared from the various lymph nodes; a portion of each was treated with 5 percent oxalic acid for the purpose of controlling contaminants, and cultures were made.

"The egg yolk agar medium of Herrold, while capable of promoting the growth of the bovine tubercle bacillus in a high percentage of instances, cannot be considered an optimal medium for all strains of the organism encountered in spontaneously infected material. The fastidiousness of the organism of bovine tuberculosis, when present in spontaneously infected tissues, suggests the use of guinea pigs rather than of culture mediums in the laboratory diagnosis of clinical material believed to contain this organism."

Eradicating tuberculosis from poultry and swine, E. Lash (*U.S. Egg and Poultry Mag.*, *40* (*1934*), *No. 5, pp. 38–41, figs. 5*).—This is a discussion of

the Federal eradication work under way, based upon the report previously noted (E.S.R., 70, p. 834).

The passage of fluids through the ruminant stomach, II, with observations on the effect of long starvation on anthelmintic efficiency, I. CLUNIES ROSS (*Aust. Vet. Jour., 10 (1934), No. 1, pp. 11–23*).—This is a report of studies conducted in continuation of those previously noted (E.S.R., 68, p. 815).

Primary mesothelioblastoma of the bovine omentum, E. JUNGHERR (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 907–914, figs. 7*).—In this contribution from the [Connecticut] Storrs Experiment Station, the author reports upon a primary mesothelioblastoma of the parietal omentum, "which, metastasized to a limited extent in the lung, was apparently responsible for an internal hemorrhage which caused the sudden death of a 14-month-old heifer. Only one other case, which, although nonfatal, was similar insofar as the host and parts affected are concerned, seems to have been reported in the literature. The cellular elements of the tumor studied by the writer resembled rounded mesothelial cells which are transitional between the mature cover cell of the serous membrane and the fibroblast. Progressive stages of indentation suggestive of amitosis were an outstanding feature of the vesicular nuclei. Since these nuclear changes are considered to be characteristic of undifferentiated mesenchymal cells, the morphologic evidence indicated that the mesothelial elements had preserved their embryonic potentialities, a fact which is thought to support Maximow's thesis in regard to the developmental possibilities of the mesothelium."

Bovine anaplasmosis from Anaplasma centrale [trans. title], E. SERGENT, A. DONATIEN, L. PARROT, and F. LESTOQUARD (*Arch. Inst. Pasteur Algérie, 11 (1933), No. 4, pp. 526–569, fig. 1*).—The authors find that *A. centrale* is a distinct species, characterized by its central position in the red blood cell, by the benignity of the infection, and by the specific immunity resulting. In the laboratory, *A. centrale* has not protected bovines against experimental infection with *A. marginale*. *A. marginale* of Algerian source and *A. marginale* from Brazil and Argentina have been found through cross-immunization tests to represent a single and the same species.

Observations on the subcutaneous vaccination of heifers against Bang's disease during calfhood, A. L. DELEZ (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 924–927*).—In work at the Indiana Experiment Station 11 heifer calves were vaccinated subcutaneously with the *Brucella abortus* culture, which had a fair degree of pathogenicity for guinea pigs, and 3 were kept as controls. "One heifer calf died before vaccination and 1 died immediately following vaccination. Exposures were given by the mouth in the fifth month of pregnancy. Seven of the 9 vaccinated heifers carried through the experiment dropped living calves. *B. abortus* was recovered from 4 of these animals. One vaccinated heifer aborted and 1 dropped a dead calf. Both of these animals were infected with *B. abortus*. One control died and 1 failed to conceive until the latter part of the experiment. This heifer was killed in the fifth month of pregnancy and no infection was demonstrated. A third control, which was exposed, aborted and *B. abortus* infection was recovered."

A Bang's disease survey of a representative dairy township, R. R. BIRCH (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 854–862*).—This is a survey made of Randolph Township, Cattaraugus County, N.Y., as fairly representative of dairy districts in the State and of other States as well, with a view to clearing up certain doubtful points regarding the prevalence and epizoology of infectious abortion. The details of the survey are presented in tabular form.

Studies on bovine mastitis.—X. The value of field and laboratory tests for the diagnosis of chronic streptococcus mastitis, S. J. EDWARDS (*Jour. Compar. Path. and Ther., 47 (1934), No. 1, pp. 49–60*).—In further studies (E.S.R., 71, p. 99) of the relative values of field and laboratory tests for the diagnosis of chronic streptococcus mastitis, 809 cows in 18 herds were examined. Of these, 295 were infected in at least one quarter with mastitis group I streptococci (*Streptococcus agalactiae*).

"The field tests included the history of the cow, a test of milk of individual quarters for its reaction, and the presence of clots. In the laboratory, the amount of deposit obtained by centrifuging was noted and a cultural examination made in or on a highly selective blood agar medium, this being the basis of comparison. The value of cultural examination of mixed samples from the four quarters was also tested.

"Of 528 infected quarters of cows said to be in full milk, 62 percent showed abnormalities to one or other of the indirect tests, but by the same criteria 9.4 percent of milk samples from 2,284 healthy quarters also showed abnormalities.

"To avoid misleading results with quarters free from *S. agalactiae*, it is preferable to accept as evidence of this infection only instances where both reaction and deposit tests are positive. When clots are present in the foremilk the cow may be regarded as infected, and this, when taken in conjunction with positive results to both reaction and deposit tests, is capable of revealing 41 percent of cows infected with latent mastitis. In cows in the drying stage, cultural examination alone is of value.

"With 219 infected cows, examination of the mixed milk samples by deep plating showed the presence of streptococci in 91 percent. The method was liable to fail only when nonhemolytic forms were present, usually in one quarter, or when the cow was infected with small numbers of beta-hemolytic streptococci. In 83 percent of infected quarters streptococci could be detected by surface cultivation.

"Procedures are outlined for the diagnosis of the disease in practice. The first plan aims at a quick and final diagnosis by cultural examination, while the second embraces a more extended application of field tests. It should be emphasized, however, that simple field tests can only serve for a preliminary survey of the herd, and the full extent of the disease can only be determined by a cultural examination of milk from individual cows."

Laboratory methods for the detection of milk from cows infected with mastitis, W. V. HALVERSEN, V. A. CHERRINGTON, and H. C. HANSEN (*Jour. Dairy Sci., 17 (1934), No. 4, pp. 281–296*).—This is a report of investigations conducted at the Idaho Experiment Station which have led to the conclusion that the leucocyte and catalase content of milk serve as the most reliable indicators of all laboratory methods employed in the detection of subclinical mastitis. The account is presented in connection with a list of 29 references to the literature.

Control of bovine streptococcic mastitis by the use of autogenous vaccine, H. R. SEDDON and A. L. ROSE (*Aust. Vet. Jour., 10 (1934), No. 1, pp. 3–10*).—The results of the vaccination work with mastitis-infected herds indicate that after vaccination (1) the incidence of infection is not altered, (2) the percentage of animals which develop mastitis recognizable by the dairyman is lowered, (3) the severity of cases is markedly reduced, and (4) the liability to recurrent attacks is much lessened.

Experimental Diplococcus inflammation of the udder of the cow: A bacteriological and pathoanatomical study [trans. title], R. OHLÉN (*Skand.

Vet. Tidskr., 24 (1934), No. 2, pp. 116–130, figs. 16; Eng. abs., p. 130).—The author has at weekly intervals successively infected the different quarters of the udder of a cow through the milk duct with diplococci.

[Premunition campaigns against bovine piroplasmoses in North Africa], E. SERGENT, A. DONATIEN, L. PARROT, and F. LESTOQUARD (*Arch. Inst. Pasteur Algérie, 9 (1931), No. 2, pp. 193–237, figs. 5; 11 (1933), No. 2, pp. 177–182*).—These contributions deal with work in North Africa (E.S.R., 59, p. 172), the fifth, sixth, and seventh campaigns covering the years 1928–30 (pp. 193–237), and the eighth and ninth campaigns the years 1930–32 (pp. 177–182).

Some historical notes on contagious pleuro-pneumonia, J. P. FOSTER (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 918–922*).—These notes include information on the appearance of contagious pleuropneumonia in Brooklyn, N.Y., in 1843 and its final eradication from the United States on March 25, 1892, after having invaded 11 States.

A nine years' field experiment on the immunisation of cattle against tuberculosis, G. DREYER, R. L. VOLLUM, and H. H. AMMITZBØLL (*Jour. Compar. Path. and Ther., 47 (1934), No 1, pp. 1–31*).—The authors report that in a practical field experiment extending over a period of nine years with a herd of cattle that was originally highly infected with tuberculosis the calves born in the herd and a few which were bought were regularly vaccinated with a dead vaccine consisting of "defatted" tubercle bacilli. In this way it was possible, without isolation or segregation of the immunized animals, to produce and maintain a high degree of immunity to tuberculosis.

"Ninety percent of the animals in the herd were tuberculous at the beginning of the experiment, and, although the immunized animals were allowed to mix freely with the infected stock, there have been only two cases of clinical tuberculosis among the 281 animals which have been immunized from an early age. Out of 55 animals which were examined post-mortem, 6 were found to have tuberculous lesions, and in 3 of these the lesions were all calcified. If the animals which have been examined post-mortem be considered as a sample of the immunized group, they would indicate that only 10.9 percent of the vaccine group have become infected, whereas at the beginning of the experiment 90 percent of the herd were infected.

"The procedure adopted is such that it could be applied to any herd of cattle without undue inconvenience or interference with the commercial management of the herd."

The details are presented in nine appended tables.

The results of the double intradermal test for tuberculosis in a small dairy herd, A. D. McEWEN and R. S. ROBERTS (*Jour. Compar. Path. and Ther., 47 (1934), No. 1, pp. 32–48*).—This report contains a record of the results of the double intradermal test for tuberculosis applied to a small dairy herd producing grade A (tuberculin-tested) milk.

Subcutaneous tuberculoid lesion of cattle: A morphologic study, W. H. FELDMAN (*Arch. Path., 17 (1934), No. 4, pp. 533–545, figs. 6*).—The author deals with the subcutaneous tuberculoid or so-called "skin lesion" of cattle that react positively to tuberculin and appear to be widely distributed over the United States, though rarely in continental Europe or in the British Isles.

"The specimens were obtained from 21 States of the United States and from Canada. There were 34 specimens which were considered tuberculoid because of the resemblance of the histologic characteristics to those of lesions of tuberculosis. Fourteen other specimens disclosed lesions that were considered nonspecific pyogenic abscesses, and 2 others revealed only thickening of the corium; one was found to represent an adenoma of the sebaceous glands. Acidfast

organisms were present in 22, or approximately 64 percent, of the 34 lesions that were designated as tuberculoid. No significant differences were observed in the character of the tuberculoid lesions in different sections of the United States, and the 1 lesion obtained from Canada was similar to the others studied. . . .

"Histologically the lesion is essentially a monocytic and epithelioid cellular reaction, with a peripheral and granulomatous encapsulation. Although the lesions usually closely resemble in appearance those of tuberculosis, evidence at this time indicates that agents other than the bacteria of true tuberculosis are probably responsible for the disease."

The liver fluke disease of cattle, M. K. Riley (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 5 (1934), pp. 10, fig. 1*).—This is a practical summary of information on the nature of liver fluke disease, the symptoms, manner of infestation, life cycle of the fluke, determination of fluke-infested areas, and problems and control measures.

Prevalence and importance of the tropical warble fly, Dermatobia hominis Linn., in Panama, L. H. Dunn (*Jour. Parasitol., 20 (1934), No. 4, pp. 219–226*).—*D. hominis* is said to affect cattle so extensively in some parts of Panama that it is of considerable importance from a purely economic standpoint. Its attacks on the cattle have produced such serious results that practically all pasture operations of the cattle industry of the Panama Canal have ceased for the time being and only fat cattle ready for very early slaughter are now purchased. "Besides man and cattle, many other animals in Panama suffer from this fly. They include sheep, dogs, cats, rabbits, monkeys, agoutis, etc."

The repellent and killing effect of Gordura grass (Melinis minutiflora Beauv.) on the seed tick, Z. de Jesus (*Philippine Jour. Anim. Indus., [1] (1934), No. 1, pp. 67, 68*).—The oil on the leaf sheaths and blades of young gordura grass is said to paste the tiny legs of seed ticks to the hairs of this grass and to cover the breathing pores, thereby killing by asphyxia. Under Philippine conditions seed ticks can remain alive and active on the leaves of cogon grass for from 93 to 98 days. It is pointed out that the gordura pasture, besides being a source of succulent and nutritious grass, can be employed as a tick-free pasture in the rotation of pastures for the control of the cattle tick.

Black scours in young sheep: Trichostrongylosis, G. Edgar (*Agr. Gaz. N.S. Wales, 44 (1933), No. 5, pp. 383–385*).—The author reports that during the preceding two years sheep breeders of New South Wales had considerable trouble with their young sheep, varying from inability to fatten the animals to serious mortality. "Affected sheep show stunted growth and 'black scours', and investigations show that the condition is due to heavy infestation with *Trichostrongylus*, the parasite commonly responsible being *T. vitrinus*."

Caseous suppuration of sheep due to Bacterium purifaciens [trans. title], M. Aynaud (*Compt. Rend. Soc. Biol. [Paris], 115 (1934), No. 1, pp. 5, 6*).—This is a report of a study made of an organism observed by Christiansen in 1917 in Denmark (E.S.R., 69, p. 717) to be the cause of a form of caseous suppuration, to which the name *B. purifaciens* n.sp. was given. This organism is said by the author to have been observed in the same disease by Magnusson in Sweden (E.S.R., 62, p. 76) and by Jowett in Scotland (E.S.R., 64, p. 74). In recent years the author has encountered cases in three different exploitations in the region of Beauce, France (E.S.R., 60, p. 179).

As regards its symptoms the affection is distinguished from other forms of caseous suppuration by its localization on the face and the neck, where multiple abscesses appear successively for a period of some months. An examination has shown it to be in reality a lymphangitis.

Bacillus pyogenes of swine and sheep [trans. title], H. VELU and G. ZOTTNER (*Compt. Rend. Soc. Biol.* [*Paris*], *115* (*1934*), *No. 1, pp. 17, 18*).—The authors point out that while the form affecting swine and that of sheep have certain affinities they are two different organisms, the principal differential characteristics of which are discussed.

Swine erysipelas and its economic importance, G. W. STILES and C. L. DAVIS (*Jour. Amer. Vet. Med. Assoc., 84* (*1934*), *No. 6, pp. 895–906, figs. 4*).—From a total of 298 swine specimens received at the Denver laboratory of the U.S.D.A. Bureau of Animal Industry during the 12 mo. preceding and which were suspected of having erysipelas, 210 cases of positive swine erysipelas were diagnosed, the remaining 88 having been found negative. "Of the 210 positive cases of erysipelas, 201 were positive serologically, with 8 acute and 1 skin cases showing negative results by the rapid whole blood agglutination test. From a total of 82 positive blood samples reacting to the rapid test in Denver, 82 (100 percent) gave positive reactions to the rapid test also at the Washington laboratory. Of the 82 samples positive to the rapid test, 79 were positive to the tube method also, as applied by the Washington laboratory. The 3 negative samples were hemolized, which made the tube reading doubtful. The rapid whole blood agglutination test devised by Schoening, Creech, and Grey [E.S.R., 69, p. 276] appears to be a valuable diagnostic agent in chronic cases of erysipelas.

"In 40 positive blood cases, the synovia likewise was positive in every instance. Synovia from several normal joints was negative to the rapid test. This is a valuable point in securing specimens from chronic cases (unincised joints) when blood is not available for examination.

"Swine erysipelas has been found in 10 counties in Colorado, and the disease is reported from 16 other States. . . . During 5 mo. there were 130,950 swine slaughtered in federally inspected establishments in Denver. Of these, 446 (0.34 percent) showed arthritis. Of the 446 arthritis cases reported for the 5-month period, 117 were tested for swine erysipelas, 113 were positive and 4 negative to the rapid test. Swine erysipelas appears to be established in many localities in the United States, and its economic importance constitutes a problem to be considered in the livestock industry."

East African swine fever, J. WALKER (*Thesis, Univ. Zürich, 1933, pp. V+139, figs. 3*).—This is a report of studies of hog cholera in east Africa, accompanied by much tabular data and several figures

Oil of chenopodium and Chenopodium plants for the eradication of round worms in swine, F. LEBLANC, T. WRIGHT, and J. B. TAYLOR (*South Dakota Sta. Bul. 283* (*1934*), *pp. 20, figs. 9*).—The studies here reported, the details of which for the years 1929 to 1933, inclusive, are presented in tabular form, indicate that if pigs are badly infested "with worms, worming them once by an efficient method as soon as possible after weaning will reduce feed costs during the subsequent feeding period. Worming the pigs a second time resulted in increased rather than decreased feed costs as compared with pigs wormed only once. The results of two tests indicate that *Chenopodium* plants may be used as a forage crop to eliminate worms and reduce grain and supplements required to produce 100 lb. of gain." Cultural methods for development of *Chenopodium* are in progress.

The brucelliasis of equines [trans. title], P. ROSSI (*Rev. Gén. Méd. Vét., 43* (*1934*), *No. 506, pp. 65–89*).—In a brief introduction it is pointed out that equines are susceptible to natural infection with *Brucella*, which is accompanied by fever and weakness with localized suppurations and abortion. In a review of the subject, presented in connection with a list of 29 references to the liter-

ature, it is pointed out that during the World War, as reported in 1919 by Fontaine and Lütje (E.S.R., 41, p. 84), 12 of 101 horses in the German army on the Russian front that were suffering from fistulous withers were found to react to the agglutination test for *B. abortus*. The contribution takes up the symptomatology, etiology, prognosis, importance, diagnosis, treatment, and prophylaxis of the disease and includes notes on 7 cases of the affection as observed in mares.

Equine dhobie itch and habronemiasis, J. R. Underwood (*Philippine Jour. Anim. Indus., [1] (1934), No. 1, p. 45*).—The author reports having found a *Microfilaria* to be the cause of dhobie itch, an annoying and persistent cutaneous disease of horses in the Philippines. Summer sore, another common skin disease found in army horses at Fort McKinley, Rizal, and caused by a species of *Habronema*, has been treated with excellent results by the use of glycerin 85 and phenol 15 parts.

The histology of equine encephalomyelitis, E. W. Hurst (*Jour. Expt. Med., 59 (1934), No. 5, pp. 529–542, pls. 4*).—The author's studies have shown that the disease of the guinea pig resulting from infection with the western virus of equine encephalomyelitis may be indistinguishable from that due to the eastern virus.

Some aspects of infection and immunity in equine encephalomyelitis, M. S. Shahan and L. T. Giltner (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 928–934*).—The authors consider the experimental evidence here reported as tending to limit the probable natural modes of infection of equine encephalomyelitis to "(1) insect transmission, (2) infection by way of the nares, (3) by introduction of virus through oral abrasions, with indications of a more or less constant viruliferous state of the blood during the earlier stages of the disease. Guinea pigs have been actively immunized by use of formol-killed vaccine of both eastern and western types to a degree sufficient to cause them to withstand exposure, the intensity of which probably never obtains in nature. Horses treated with formol-killed vaccine were protected against subcutaneous and intranasal infection, either of which method simulates what may be expected to occur in nature. Further experimental work is necessary to determine the efficacy of vaccinations as a practical procedure."

Immunity in equine infectious anemia [trans. title], L. Balozet (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 10, pp. 992, 993*).—A brief reference to the studies of earlier workers is followed by a discussion of the author's observations.

Observations on the bones of native horses affected with osteomalacia, M. D. Sumulong (*Philippine Jour. Anim. Indus., [1] (1934), No. 1, pp. 53–56*).—The manuscript, an abstract of which is noted, is said to include a brief review of the available literature on osteomalacia and to be illustrated by 2 figures and 5 plates.

Experimental studies on the curative treatment of surra in native horses in the Philippines, L. M. Yutuc (*Philippine Jour. Anim. Indus. [1] (1934), No. 1, pp. 31, 32*).—The author reports that by the administration of etharsanol and Naganol in nonlethal but slightly toxic doses, and in simultaneous injection, 3 experimental surra horses with positive cerebrospinal fluid and 6 out of 10 naturally infected animals were cured. Some of the results of the experiments indicated that there is a synergistic relation between the two drugs used which is possessively responsible for the complete sterilization of the cerebrospinal fluid concurrently with the circulatory system. It is said that the simultaneous injection of etharsanol and Naganol is far superior to either of the two drugs when given alone and intravenously for the treatment of equine surra.

Observations on first-stage larvae of Gasterophilus intestinalis in tongues of horses in central Iowa during December 1932 and January 1933, E. F. KNIPLING (*Jour. Parasitol., 20 (1934), No. 3, pp. 196, 197*).—The author reports in tabular form on the tongues examined and the larvae of the horse botfly recovered during consecutive weekly periods in December 1932 and January 1933.

[Blacktongue and yellow liver in the dog] (*U.S. Pub. Health Serv., Natl. Inst. Health Bul. 162 (1933), pp. III+45, pls. 8*).—Four contributions are here presented, namely, The Blacktongue (Canine Pellagra) Preventive Value of 15 Foodstuffs, by G. A. Wheeler and W. H. Sebrell (pp. 1–11); Pathology of Experimental Blacktongue, by R. D. Lillie (pp. 13–21); "Yellow Liver" of Dogs (Fatty Infiltration) Associated with Deficient Diets, by W. H. Sebrell (pp. 23–35); and The Pathology of "Yellow Liver" of Dogs, by R. D. Lillie and W. H. Sebrell (pp. 37–45).

Parasitic worms of dogs and cats in Palestine, G. WITENBERG (*Vet. Rec., 14 (1934), No. 9, pp. 232–239*).—This account, which includes a check list of the more important helminth parasites of the world that have been recorded from the dog and the cat, is presented in connection with a list of 26 references to the literature.

Some of the tissue changes in poultry resulting from the ingestion of sodium bicarbonate, G. F. DELAPLANE (*Vet. Alumni Quart. [Ohio State Univ.], 21 (1934), No. 4, pp. 149–166*).—The author concludes from studies conducted at the Rhode Island Experiment Station that the continued ingestion of sodium bicarbonate by chickens produced lesions similar to those seen in natural cases of gout. A list is given of 34 references to the literature.

Studies on coccidiosis.—V, Treatment with powdered buttermilk, R. L. MAYHEW (*Jour. Parasitol., 20 (1934), No. 4, pp. 230–242, figs. 2*).—This is a report of information secured at the Louisiana Experiment Station in continuation of work previously noted (E.S.R., 69, p. 594) relating to the use of 40 percent buttermilk mash in the treatment of coccidiosis. The author has found weight to be the most definite measurable difference between chickens inoculated with coccidia and their controls.

"Data are presented on 349 birds reared from 12 lots and in 7 different groups. Data are presented on 63 severely affected birds selected from the total number of infected individuals. The results obtained indicate that there are no beneficial results obtained on the weights by the use of a 40-percent buttermilk mash in the treatment of coccidiosis. The percentage difference between the weights of the diseased and the control birds is a measure of the direct economic loss resulting from a severe epidemic of coccidiosis, since it represents a direct loss in profit when birds are sold by weight. The results emphasized the importance of parasitic control in such types of experimental work involving the continued general good health of animals.

"The observations indicate the necessity of complete data, such as individual fecal examinations, diagnosis of hemorrhage, and frequent weights, as measures of the results of treatment of coccidiosis in chickens. Emphasis should be placed upon environmental conditions surrounding the birds during the period of convalescence. In fact, it is believed that better conditions must be provided than is practicable or economical for most poultrymen to provide or the death rate will be influenced by other factors than the disease."

A list is given of 12 references to the literature.

Studies on coccidiosis.—VI, Effect of early attack on egg production, R. L. MAYHEW (*Poultry Sci., 13 (1934), No. 3, pp. 148–154, figs. 3*).—This is a continuation of the work above noted.

The information obtained from 79 hens which had been artificially inoculated with coccidiosis when 6 to 8 weeks of age shows that they laid 19.25 percent fewer eggs per hen than the 103 control fowls. "The 31 severely affected birds, selected on the basis of gain in weight and the occurrence of hemorrhage at the time of the attack of coccidiosis, laid 45.51 percent fewer eggs and began to lay 6.6 weeks later than the controls. No cases of chronic coccidiosis developed among the adult birds, hence it is concluded that birds recovering from an acute attack are not susceptible to the chronic form. Since mortality was well distributed among the three groups of hens, it is concluded that an early attack of the disease does not predispose to future attacks or to other diseases.

"The results obtained indicate that chickens whose growth has been affected by an early attack will eventually attain normal weight, but their growth will be retarded for 5 to 6 mo. after the attack."

A hemophilic bacterium as a cause of infectious coryza in the fowl, C. P. Eliot and M. R. Lewis (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 878–888*).—In continuation of studies by Lewis and Mueller previously noted (E.S.R., 71, p. 395), the authors point out that it had been found by inoculation of healthy chickens 6 mo. old that the infectious agent is present in great dilution of unfiltered extracts of the exudate and tissue of the nasal passages, and that it remains active for a period of 24 hr. and occasionally 48 hr. at 37° C. and for several days longer at ice-box temperature.

In the study here reported it was found on examination that because of its growth requirements, its morphology, and its habitat, this bacterium should probably be classified with the other hemophilic organisims in the genus *Hemophilus*. "Because it is isolated from the chicken and its etiological relationship to at least certain cases of infectious coryza in the chicken has been demonstrated, the specific name *gallinarum* is proposed. A similar and possibly identical organism has been described by De Blieck [E.S.R., 67, p. 170] as *Bacillus haemoglobinophilus coryza gallinarum*. The name *Hemophilus gallinarum* is herewith submitted with the recommendation that it is fully as descriptive as De Blieck's, and in addition that it meets the requirements of our bacteriological system of binomial nomenclature."

A note on the histopathology of infectious avian laryngotracheitis, F. Thorp, Jr., and R. Graham (*Poultry Sci., 13 (1934), No. 2, pp. 102–109, figs. 12*).—The authors find that "the most consistent histopathologic changes in infectious laryngotracheitis appear in the mucosa and submucosa of the larynx and trachea, and to a lesser degree in the bronchi and lungs. Edema, hemorrhage, and cellular infiltration, with intranuclear inclusions in the epithelial cells of the larynx and upper trachea, are frequently seen. Microscopic lesions may also be present in the lungs, kidneys, myocardium, and liver, suggesting the systemic invasion of the virus. The microscopic hemorrhagic lesions in myocardial and renal parenchyma may contribute to the dyspneic syndrome, which is not explained in all cases by the presence of marked gross changes in the upper respiratory tract. Bacteria in clumps may be found in the laryngeal and tracheal exudates."

A list is given of 20 references to the literature.

The supplement to the knowledge of the leucosic micro-morphological picture by the fowls [trans. title], D. Vinčeković (*Vet. Arhiv, 4 (1934), No. 1, pp. 21–48; Eng. abs., pp. 46–48*).—A contribution upon leucosis, based upon studies conducted in Yugoslavia. The account is presented in connection with a list of 20 references to the literature.

Familial incidence of lymphocytoma in three generations of the domestic fowl, R. Fenstermacher (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 863–877*).—In studies at the Minnesota Experiment Station, the details of which are presented in tabular form, a total of 735 chicks was hatched, of which 494 were raised beyond 6 mo. of age. Of these birds, 15.9 percent developed lymphocytoma. "The incidence of the disease was materially reduced in the second generation as compared to what occurred in the first-generation birds. The disease was not transmissible by artificial inoculations. The disease was not transmitted by contact. Only one case of fowl paralysis developed. No data were obtained to show that lymphocytoma and fowl paralysis are manifestations of a single disease."

A list is given of 13 references to the literature.

Cultivation of avian pest virus (Newcastle disease) in tissue culture, T. Topacio (*Philippine Jour. Anim. Indus., [1] (1934), No. 1, p. 51*).—The author found a vaccine prepared from cultured virus that was applied to a few birds to confer an immunity which resisted a test inoculation of virulent saliva.

The use of different concentrations of tuberculin in the diagnosis of tuberculosis of chickens, W. H. Feldman (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, pp. 889–894*).—In work conducted under natural and experimental conditions, "a series of hens aged from 1 to 3 yr. were given injections simultaneously with tuberculin of the usual (50 percent) concentration and a greatly diluted product containing 0.01 mg of Old Tuberculin in each 0.1 cc of injection fluid. All injections were intradermal. The positive reactions elicited by the less concentrated tuberculin were rather consistently inferior to those provoked by the tuberculin of standard (50 percent) strength. Also many more positive reactions were obtained by the use of the more concentrated tuberculin than were secured by the weaker product."

The results obtained led the author to conclude that "(1) tuberculin of standard concentration (50 percent) is of greater reliability in the diagnosis of avian tuberculosis than a product in which the active principle has been diluted to a concentration comparable to that suitable for the Mantoux test for human beings. (2) The nature, pathogenesis, and the subsequent course of tuberculosis of fowls probably differs sufficiently from that of mammals to require a tuberculin of greater potency for diagnostic purposes."

Avian tuberculosis in free wild birds, L. B. Kalter, H. Federighi, and O. L. Inman (*Ohio Jour. Sci., 33 (1933), No. 6, pp. 451, 452*).—A brief account is given of the occurrence of avian tuberculosis as observed in fowls. Reference is made to the preliminary account of the occurrence of tuberculosis in the crow (*Corvus brachyrhynchos brachyrhynchos*) by Mitchell and Duthie (E.S.R., 62, p. 377), in addition to which it is reported that Mitchell examined over 600 wild crows, approximately 8 percent of those captured having been found tuberculous. The author reports a case of tuberculosis, apparently of the avian type, in a male eastern sparrow hawk (*Falco sparverius sparverius*) which was found dead, but still warm, on a street in Yellow Springs, Ohio, in January 1933.

Some observations on gape-worm in poultry and game birds, D. O. Morgan and P. A. Clapham (*Jour. Helminthol., 12 (1934), No. 2, pp. 63–70*).—The authors have obtained *Syngamus trachealis* from "the rook and pheasant, in both of which there were very heavy infestations, and from the starling and partridge, in which the infestations were lighter. Infections to chickens were attempted from all these sources with varying degrees of success. A great variety of doses were given, but only occasional successes can be recorded with the rook and pheasant material, while wholly negative results

were obtained with the partridge and starling material. No infections were obtained from feeding eggs of *S. merulae* from blackbirds to chickens. Much greater success has, however, been obtained by feeding earthworms with eggs of *S. trachealis* and then feeding these earthworms to chickens. It is not merely that the gapeworm has been passed to chickens, but the actual disease, with all its attendant symptoms, has been produced."

Some observations on the response of chickens to infestation with Heterakis gallinae, P. A. Clapham (*Jour. Helminthol., 12 (1934), No. 2, pp. 71–78*).—The author found the eggs of *H. gallinae* can remain viable in the soil for a considerable time, and that they are able to produce an infestation at least 12 mo. after reaching the infective stage.

Disinfection of poultry houses by means of "fire guns".—A preliminary note, H. J. Stafseth and F. Camargo (*Jour. Amer. Vet. Med. Assoc., 84 (1934), No. 6, p. 923*).—Brief mention is made of the use of the so-called fire gun or torch, which appears to give unsatisfactory results, several common organisms, including *Salmonella pullorum*, surviving an exposure to the flame for 10 and 15 sec.

Bacterium pfaffi (Hadley) infection in canary birds, N. Hole (*Jour. Compar. Path. and Ther., 47 (1934), No. 1, pp. 61–63*).—This is a report of an epizootic that occurred in 1931 in a small aviary in Kent in which canaries, goldfinch mules, greenfinches, linnets, crossbills, pekin robins, red-crested cardinals, waxbills, siskins, and other finches were kept. Seven of eight canaries are said to have died within a month, and a great majority of the other birds also succumbed. A description is given of the laboratory investigations, biochemical reactions, and pathogenicity of the organism, which is considered to have been *Shigella (Eberthella) pfaffi*.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Iowa Station], J. B. Davidson, E. V. Collins, W. G. Murray, S. H. McCrory, R. B. Gray, C. K. Shedd, H. Giese, H. J. Barre, and I. E. Melhus (*Iowa Sta. Rpt. 1933, pp. 20–23, fig. 1*).—The progress results are presented of an economic and engineering study of corn production methods in Iowa, and of studies of farm building losses due to wind and fire, the all-masonry barn, the use of tractors, tractor wheel efficiency, and the development of equipment for checkrowing beets.

[Agricultural engineering investigations at the Louisiana Station] (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp. 9, 10*).—The progress results of recent investigations are presented on artificial hay drying and the development of tillage machinery for corn and soybean production.

[Agricultural engineering investigations by the Massachusetts Station], C. I. Gunness and R. L. France (*Massachusetts Sta. Bul. 305 (1934), pp. 6, 16, 17*).—The progress results are presented of investigations on apple storages, apple handling equipment, fertilizer distributors, milk cooling equipment, and the indol tolerance of the *coli-aerogenes* group of bacteria as a possible means of differentiating fecal and nonfecal strains occurring in drinking water supplies.

[Agricultural engineering investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 280 (1934), pp. 27, 28*).—The progress results are presented of investigations on electric brooding of chicks, by W. T. Ackerman, G. M. Foulkrod, and A. E. Tepper; pneumatic tires for tractors and steel tractor wheel equipment, both by Ackerman and Foulkrod; and electric water heating and sterilization, by Ackerman and H. N. Colby.

Surface water supply of the United States, 1932, parts 1, 12 A (*U.S. Geol. Survey, Water-Supply Paper 726 (1934), pp. X+378, fig. 1; 737 (1934), pp. VI+184, fig. 1*).—Part 1 of this report, prepared in cooperation with the States of Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and West Virginia, presents the results of measurements of flow made on streams in the North Atlantic slope basins during the year ended September 30, 1932. Part 12 A, prepared in cooperation with the States of Idaho, Montana, and Washington, presents corresponding measurements in the Pacific slope basins in Washington and the upper Columbia River Basin.

[Irrigation investigations with rice at the Arkansas Station] (*Arkansas Sta. Bul. 297 (1934), pp. 75, 76*).—In a summary of work carried on by the station since its establishment, progress results are presented of investigations on duty of water and underground water resources for rice irrigation, including data on cost of pumping.

The role of vegetation in erosion control and water conservation, W. C. Lowdermilk (*Jour. Forestry, 32 (1934), No. 5, pp. 529–536*).—Herein is presented a review of present knowledge of the role of forests and other vegetation in erosion flood control and water supply, together with suggestions as to needed studies along these lines. A bibliography of 45 references is included.

Public Roads, [April and May 1934] (*U.S. Dept. Agr., Public Roads, 15 (1934), Nos. 2, pp. 29–56+[2], figs. 25; 3, pp. 57–84+[2], figs. 32*).—These numbers of this periodical contain the status of U.S. Public Works road construction as of March 31 and April 30, 1934, respectively, together with the following articles:

No. 2.—The Construction of High-Type Bituminous Pavements, by C. F. Rogers (pp. 29–53).

No. 3.—Some New Relations Bearing on Concrete Mixtures, by W. A. Blanchette (pp. 57–75); Mechanical Analysis of Portland Cement by the Hydrometer Method, by E. A. Willis and C. M. Johnston (pp. 76–78); and Observations on Bulldozers and Large Scrapers in Grading Work, by A. P. Anderson (pp. 78–81).

The use and expense of farm implements, G. B. Byers and B. T. Inman (*Kentucky Sta. Bul. 345 (1933), pp. 233–258*).——This report presents a description of the use and analysis of the investment and expense of farm implements on 101 farms in Christian and Todd Counties for the farm year 1930.

Farm implements represent 3.5 percent of the farm investment for the State and 4.6 percent for the farms studied. The total current implement expense on these farms was 8.4 percent of the current farm expenses for 1929. Over 90 different kinds of implements were reported on the 101 farms, and the wagon was the only implement found on all farms. The total days of service during the life of most implements was short, largely due to the short seasonal use of many implements. Depreciation represented 47.7 percent of the total annual expense of farm implements on the 101 farms, repairs 2[illegible].4, interest 17.8, housing 4.6, oil and grease 4.6, insurance 2, and taxes 0.9 percent. Forty-five tractors showed an average annual use per tractor of 28.8 days, of which 65.2 percent was drawbar work and 34.8 percent belt work. The drawbar expense averaged 81 ct. per hour and belt work 72 ct. per hour. The expense of tractor operation per acre covered varied from 24 ct. an acre for pulling the rotary hoe to $1.12 an acre for breaking ground.

The expense of farm implements was influenced by size of farm, days of annual use, type of operating labor, use of repair shop, and housing, purchasing, and discarding practices. Size of farm and annual use are closely related

in their effect upon the economical use of implements, as shown by the general decrease in unit expense as use increased. The acreage increase should be of such a size as to make the fullest use of the implements that have to be duplicated. Where it was not possible to make the fullest use of the added machines the expense was increased and the operator did custom work as a means of controlling this increased unit cost. The hourly operating expense on the tractor decreased 99 ct. with an increase in annual use from 106 to 485 hr., but a further increase in annual use showed only a slight decrease in expense. The annual expense for 9 binders that harvested an average of 14 acres was $1.03 compared to 31 ct. an acre for 7 binders which harvested 76 acres annually.

The study indicated that hired labor increased the annual implement expense.

The farm repair shop made possible a saving of $5.47 in expense for each $100 of implement investment by the use of 1.25 hr. of additional farm labor. Implements that were made of wood and the more complicated machines were housed all the year except during the working season. A study of the effect of housing upon the mower showed a saving of 7.7 ct. an acre covered when the machines were housed. The proper selection and adaptation of implements to the farm needs determine to a considerable extent the service secured. Sixty-two implements were discarded because they were not needed, though still in working condition, and 40 implements were discarded because they were not adapted to the work.

Prolonging plowshare service, H. Beresford and E. N. Humphrey (*Idaho Sta. Bul. 202 (1934), pp. 8, figs. 4*).—The results of tests on the stelliting of plowshares are briefly reported in which three outfits plowed 200 acres.

For the first trial, which was made in the spring, one treated share was placed between two untreated shares on a tractor gang plow and a record kept of the operation of the plow. In the fall two outfits were tested—one a 4-bottom tractor gang plow and the other a 3-bottom gang plow drawn by horses. Record was taken of the maintenance required for the shares before and after the alloy treatment. The soil was dry, and in the case of the horse-drawn gang plow[1] conditions were very severe. The soil was composed of decomposed granite rock.

In the first test with the single share ¼ lb. of alloy was applied. The plow was used in Palouse clay loam, plowing 7 to 8 in. deep and averaging 10 acres per day for the outfit. The original shares were identical except for the alloy treatment. Before any servicing became necessary on the treated share the others had been sharpened four times.

In the tests in which the plow was drawn by horses, before the alloy treatment was used the shares were sharpened and pointed every other day at a cost of 43.8 ct. per acre. After treatment with 41/100 lb. of alloy per share, 74 acres were plowed at a cost of 16.3 ct. per acre for the treatment. If the time and labor spent changing shares and taking them to town to be sharpened is considered along with the better performance of the plow and the decreased depreciation due to the greater wear on the untreated shares, the saving in plowing costs is between 30 and 50 ct. per acre in favor of the alloy treatment.

Information is included on the method of applying stellite.

Dairy refrigeration on rural electric lines, E. C. Easter and M. L. Nichols (*Alabama Sta. Bul. 241 (1934); pp. 12, fig. 1*).—This bulletin reports the results of studies made as a part of the experimental work on rural electrification conducted in cooperation with the Alabama Power Company and with dairymen in different sections of the State. The work was based upon studies of the

requirements for proper refrigeration of dairy products, as determined by bacteriologists and public health officials. Its objects were to study (1) small dairy refrigeration units and results obtained from their use, and (2) the adaptability of electrically operated equipment to the refrigeration needs of the dairies.

Electrically operated refrigerating equipment was found to meet the requirements for satisfactory dairy refrigeration when machines of sufficient capacities were propery installed. Retail and wholesale dairies, for complete refrigeration, should have plants with respective minimum capacities of 15 and 10 lb. ice-melting capacity per 24-hr. operation for each gallon of milk produced per day. By circulating fresh water through the upper sections of the tubular cooler, these minimum capacities can be reduced to 12.5 and 7.5 lb. The refrigerating equipment must have sufficient capacity for complete refrigeration without operating more than 18 hr. per day.

The most important single factor affecting both the efficiency and cost of proper refrigeration at the dairy was found to be that of insulation. Poor or inadequate insulation results in incomplete refrigeration at increased cost.

To operate refrigerating equipment for complete refrigeration at retail dairies required an average of approximately 7.6 kw.-hr. of electricity per month for each gallon of milk cooled per day. For wholesale dairies this average was approximately 4.6 kw.-hr.

Ventilation of poultry houses, E. R. GROSS (*New Jersey Stas. Circ. 306 (1934), pp. 4, fig. 1*).—Practical information is given on the planning and installation of ventilation equipment for poultry houses.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Arkansas Station] (*Arkansas Sta. Bul. 297 (1934), pp. 22–26, 37–41, 76, 77, 89, 90, 91, 92, 95, 96, 97, 120–122*).—Investigations in agricultural economics since 1925 are summarized. Some of the findings in the investigations of man, horse, and tractor work in producing cotton (pp. 22–24), of man-hour requirements for other crops (pp. 24, 25), of costs of producing cotton (p. 26), of financing cotton production (pp. 37–39), of cotton marketing (pp. 39–41), of returns and cost of production on rice farms (pp. 76, 77), of production costs and marketing of apples (pp. 89, 90), peaches (pp. 91, 92), grapes (pp. 95, 96), and strawberries (p. 97), and of different phases of taxation (pp. 120–122) are given.

[Investigations in agricultural economics at the Iowa Station, 1932–33] (*Iowa Sta. Rpt. 1933, pp. 8–19, figs. 4*).—Brief statements cover the general findings not previously noted for the following investigations: Stock-share farm leasing, by M. Peck; packer demands for Iowa hogs, by P. L. Miller, I. W. Arthur, M. D. Helser, and F. J. Beard; economic aspects of the soybean enterprise in Iowa, by W. G. Murray and H. D. Hughes; detailed farm records and accounts for Webster County, by J. A. Hopkins, Jr., and A. G. Black; destination and origin of Iowa's commercial corn and oat crops, by R. C. Bentley; Iowa farm land values, by Peck; livestock shipments and prices, by Miller and S. H. Thompson; seasonal fluctuations in marketing Iowa hogs, by Miller; use of the motor truck in livestock marketing, by Miller and D. A. FitzGerald; recent trends and present status of Iowa farmers' elevators, by F. Robotka; farm organization and management in southern Iowa, with special emphasis on baby beef production, by Hopkins, C. C. Culbertson, and R. Beresford; farm lay-out studies, by Black and E. V. Collins; and farmers' practices in marketing eggs—(1) factors influencing quality, by W. D. Termohlen and R. L. Cochran.

[Investigations in agricultural economics at the Maine Station, 1932–33] (*Maine Sta. Bul. 369 (1933), pp. 503–517, figs. 5*).—Results of investigations not previously noted are reported on some of the recent important changes in the frequency of delivery, distance hauled, method of delivery, etc., found in an economic study of the cost of collecting milk and cream in Maine, on the farm capital, receipts, expenses, profits, and acreages, crops, livestock, tractive power, and the relationship between labor income and size of business, production rates, use of capital, use of labor, and use of tractive power as shown by business records taken on 165 potato farms in Aroostook County for the years ended March 31, 1929, 1930, and 1931; and on sources of purchases of dressed fowl and chickens by 106 retail establishments in York County from April 1931 to June 1932.

[Investigations in agricultural economics and farm management by the Massachusetts Station] (*Massachusetts Sta. Bul. 305 (1934), pp. 5, 37, 38*).—In addition to results of investigations previously noted, some findings on other investigations are included for the fiscal year ended November 30, 1933, for a study of competitive factors influencing the supply of market milk and cream in Worcester, by A. H. Lindsey and A. E. Cance, and as to labor in bunching asparagus and the use of low wagons and mowing machines in handling silage, by R. L. Mighell and R. H. Barrett.

[Investigations in agricultural economics by the New Hampshire Station, 1933] (*New Hampshire Sta. Bul. 280 (1934), pp. 4, 5, 6*).—Investigations not previously noted are reported on some findings by E. J. Rasmussen and H. C. Woodworth in a spray cost study regarding the most economical equipment and size of crew, and on findings by H. C. Grinnell regarding the profitableness of raising and selling cows as an enterprise separate from milk production.

Montana farm taxes, R. R. RENNE and B. W. ALLIN (*Montana Sta. Bul. 286 (1934), pp. 55, figs. 15*).—This study, made in cooperation with the U.S.D.A. Bureau of Agricultural Economics, covers in general the period 1913–33, and includes analysis of the amounts and trends of farm real estate taxes in Montana, of the distribution of the Montana farm tax dollar, 1913 and 1933, by tax-levying authority and by purpose of levy, and of the costs of governmental services in Montana. Comparisons are made of farm taxes and governmental costs in Montana with those in other States, and the averages for the United States. The revenue system of Montana is discussed. The estimated Montana farm real-estate taxes used are based upon an analysis of tax records for the period 1913–33 of 520 farms scattered in 25 counties of the State. Other data were obtained from records of the State, the Federal Department of Agriculture, and the Federal Bureau of the Census. Some of the findings were as follows:

Estimated taxes per acre in Montana increased from 7.6 ct. in 1913 to 15.3 ct. in 1921, and then decreased to 11.4 ct. in 1933. Taxes per $100 of full value increased from 41 ct. in 1913 to $1.54 in 1932. Taxes on irrigated lands were 78 percent higher in 1933 than in 1913, those on nonirrigated tillable land 80 percent higher, and those on grazing land 13 percent higher. Gross cash income of Montana farmers in 1933 was only 38 percent of the average for the period 1924–26, but taxes in 1933 were about 86 percent of the average for the earlier period. In 1933 approximately 70 ct. of each dollar of taxes was levied by the counties, 22 ct. by school districts, and 8 ct. by the State, as compared with 70, 18, and 12 ct., respectively, in 1913. The levies for different purposes in 1933 and 1913 were approximately as follows: Elementary and high schools, 45.9 and 35.5 ct.; general county administration, 15.7 and 22.8

ct.; county bond interest and principal, 11.4 and 3.7 ct.; county poor relief, 9.2 and 1.2 ct.; Greater University of Montana, 4 and 3.9 ct.; general State administration, 3.2 and 6.6 ct.; debt service for university buildings, 1.3 and 1.3 ct.; roads, 4.3 and 15 ct.; bridges, 2.5 and 5.5 ct.; and miscellaneous county purposes, 2.5 and 4.5 ct.

Montana local governments (counties and their minor subdivisions) in 1932 derived about 83 percent of their total tax revenue and about 70 percent of their total revenues from the property tax. The State government derived less than one-third of the total tax receipts and less than one-sixth of the total revenues from the property tax. Cost of all governmental services in Montana increased from slightly over $18,000,000 in 1913 to nearly $45,000,000 in 1930, and then declined to less than $42,500,000 in 1932. On June 30, 1933, 23 percent of the total taxes levied in 1932 were unpaid, and taxes for all years due and not paid totaled nearly 75 percent of the total levy in 1932.

Environment, heredity, and wheat quality, C. L. ALSBERG and E. P. GRIFFING (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 10 (1934), No. 6, pp. [2]+229-249*).—"Climate is more important in determining wheat quality than soil or wheat variety. The texture of soil is more important than its chemical composition, because upon it depends the soil's capacity to hold moisture. Variety in itself does not determine wheat quality, for high-protein seed, under adverse conditions, may yield grain of low protein content.

"The ratio of protein to starch in the wheat kernel is largely determined by moisture conditions, especially at the time of blossoming and in the postfloral period. The wheat highest in protein content tends to be produced where summers are hot and dry, and moisture has not been too far above the minimum during the earlier stages of growth and rather scant but not too scant in the postfloral period. Longer and cooler summers, with greater abundance of moisture, tend to prolong the postfloral period; and prolongation of the postfloral period tends to reduce protein content.

"Although wheat variety in itself does not determine wheat quality, some varieties within a given climate have higher protein content than others. Hence wheat quality in humid climates is susceptible of vast improvement. Stimulus toward such improvement has been lacking because improvement in quality is usually accompanied by some reduction in yield. But a new stimulus has recently appeared in governmental policies directed toward self-sufficiency of importing countries with regard to bread grains. Reduction of imports of high-protein wheat can be facilitated through development of higher-quality domestic wheats. If present isolationist policies contine, strenuous efforts to breed varieties higher in protein than those now grown are to be expected, and are likely to meet with an appreciable measure of success."

Studies in economics of apple orcharding.—II, A study of farm organization on 12 fruit farms, H. C. WOODWORTH and G. F. POTTER (*New Hampshire Sta. Bul. 279 (1934), pp. 32, figs. 11*).—This is the second of a series of bulletins previously noted (E.S.R., 66, p. 83). Tables show for each year studied the average capital investment and inventory changes, by items; the average expenses and receipts, by items; total gross returns, total estimated costs of harvesting and marketing, and estimated returns per bushel, on tree, etc.; the average farm income, average interest on investment, and average labor income; and the incomes on the individual farms.

The distribution of time on apples for harvesting and prior to harvest, on supplementary enterprises (strawberries, cherries, beans, potatoes, timber, cows, and poultry), and on miscellaneous tasks is discussed, with charts showing the seasonal distribution prior to harvest, for harvesting, and for

grading, packing, and marketing on farms varying as regards diversification, varieties of apples grown, marketing methods, etc.

Bartlett pear orchard management, A. Shultis (*Calif. Agr. Col. Ext. Circ. 78 (1933), pp. 46, fig. 1*).—This study was made by the Giannini Foundation in cooperation with the U.S. Department of Agriculture. Records were obtained for two or more of the years 1926–31 from orchards in five counties of California, there being 200 records for mature (9 yr. or older) and 149 for young orchards. Analysis is made of the factors affecting profits, prices, and yield, of labor, material, and cash overhead costs, and of depreciation and interest on investment. Explanation is made of how the grower may utilize the information presented and how he may determine his operator's income.

Beef cattle production in Minnesota, C. W. Crickman, G. A. Sallee, and W. H. Peters (*Minnesota Sta. Bul. 301 (1934), pp. 76, figs. 28*).—This study was made by the divisions of agricultural economics and animal industry of the station in cooperation with the Bureau of Agricultural Economics, U.S.D.A., and is based on detailed accounting records obtained on each of 20 or more selected beef-cattle farms in Rock and Noble Counties, Minn., during the 3-year period 1929–31, on data regarding past experimental trials in beef-cattle feeding at the University Farm and the Northwest Experiment Station, Crookston, Minn., and on other data collected by the station and Federal Government. The bulletin sets forth the functions of beef cattle in the agricultural industry, traces briefly the forces influencing the development of the beef-cattle enterprise in Minnesota, outlines the present status of the industry in the State, presents and discusses the unit factors of cost in the production of beef cattle under the various systems of management commonly practiced in Minnesota, indicates the conditions, physical and economic, under which beef cattle have a comparative advantage in the organization of Minnesota farms, presents approved practices of beef-cattle management, and brings together such information as is available on the beef-cattle supply and price situation.

A baby-beef herd provides the maximum utilization of a combination of concentrates, roughages, and pasture per unit of labor expended. A dairy-cattle herd uses smaller quantities of grain in proportion to roughage and a much smaller quantity of feed, including pasture. The milk-and-beef system attempts to combine the merits of beef-cattle production for utilizing large quantities of feeds and pasture with those of dairying for labor utilization. Purchased feeder cattle rank next to hogs in the use of concentrates per acre of pasture used and per unit of labor expended. The total investment per farm herd, 1929–31 values, were for baby beef, $4,146; milk-and-beef, $3,239; purchased feeder, $2,770; dairy, $4,480; sheep, $2,870; and hogs, $1,008. The distribution of labor demands for beef cattle or sheep is better suited to supplement crop production on most cornbelt farms than that of dairy cattle. In southwestern Minnesota a beef-cattle farm—25 baby beeves and 20 litters of hogs—should approximate 300 acres or more if bluegrass pasture is used. A milk-and-beef herd of 20 cows and offspring would use about the same acreage of grain and roughage as a baby-beef herd of 33 cows and their calves, but about 30 acres less bluegrass pasture. Forty yearlings or 2-year-old feeders with 20 litters of hogs would require a farm of 280 acres or more, depending upon normal corn yields. The cropping system on a beef-cattle farm should provide concentrates and roughages in excess of the requirements for work stock, hogs, and poultry in the following proportions: Baby beef, 1 lb. concentrates to 1.8 lb. roughages; milk-and-beef herd, 1 lb. to 1.7 lb.; and purchased feeders, 2.4 lb. to 1 lb. The proportions of pounds of corn to pounds of small grain fed were 4 to 1 for baby beef and 6 to 1 for purchased feeders.

with bluegrass or other tame grass, approximately 25 percent of the farm should be in pasture for a baby-beef herd and 20 percent for a milk-and-beef herd.

Animals capable of producing regularly high quality beef-type calves and low-cost rations for the cow herd are important with a beef-cattle herd. Economy must be practiced in cash outlays for breeding stock, buildings, and equipment with purchased feeders. A reasonable assurance of a margin between the purchase price of thin cattle and the selling price of the fattened animals is of greater importance than the particular type or grade of cattle.

"During the next few years the beef-cattle enterprise on Minnesota farms should be adjusted to low-cost production methods, and the cull animals should be disposed of as rapidly as possible. Beef-cattle farmers should bear in mind, however, that it is only with beef cattle or other roughage-consuming animals that any returns can be obtained from nontillable land and unsalable feeds. Caution should be exercised in depleting foundation herds beyond the point of quick recovery when the turn in the industry is reached."

Farmers' elevators in the spring wheat area of South Dakota.—I, Business operations, 1921–22 to 1930–31, R. E. Post (*South Dakota Sta. Bul. [282] (1933), pp. 90, figs. 34*).—This is the first of a series of bulletins reporting the results of a study of the problems of management, organization, and financing of farmers' elevators in South Dakota. Part of the data was obtained in cooperation with the Bureau of Agricultural Economics, U.S.D.A., and the State experiment stations of Minnesota, Montana, and North Dakota. The present bulletin is based on data obtained in a detailed survey of 26 elevators in the spring wheat area for each year 1921–22 to 1930–31, inclusive. "Expenses, net income, and economic profit, all in terms of per dollar sales or per bushel handled, are used as measures of operating effectiveness by which to analyze variations in elevator business units." The changes from the first to the second 5 years of the study are discussed, with tables and charts showing for each 5-year period the bushel volume and dollar volume of sales by elevators; the income, expenses, and net income per dollar of total sales; computed stock dividends (7 percent) per dollar of average total sales; profit per dollar of total sales, with and without additional income (income from sources other than trading); and additional net income per dollar of total sales.

Analysis of the business as a whole is made by bushel-volume groups, pointing out the relative importance of the grain business as compared with general and special side lines and the relative effectiveness of operations, both by years and by 5-year periods. In the analysis of the grain business, which is based on the data for the second 5-year period, the various items of expense in handling grain, the effect of volume of business upon several items, relation of volume of business to net income, the net income per bushel from different grains, the effect of competition, buying practices, marketing practices and methods, hedging, storing and handling, and the relation between volume handled to profits, are discussed.

The analysis of the enterprises supplementary to the grain business covers general side lines, such as coal, flour and feed, twine, salt, fencing, etc.; special side lines, such as gasoline and oil, implements and hardware, and lumber; and services and miscellaneous items, including handling livestock, grinding, and other more or less incidental services.

Three elevators out of 24 had negative economic profits during the first 5-year period and 10 during the second 5-year period. With minor exceptions, expenses decreased and net income and economic profit increased as volume

of business increased. Grain expense averaged about 12 ct. per bushel with a volume of business at 50,000 bu., 5 ct. at 95,000 bu., 4 ct. at 125,000 bu., and 3.3 ct. at 250,000 bu. The greatest decreases occurred in salaries and depreciation. Grain net income averaged about 1.2 ct. at 150,000 bu., 1.7 ct. at 200,000 bu., and 2 ct. at 270,000 bu. Of the general side lines coal was first and flour and feed second in total amount handled. Salt was first and coal second in gross profit per dollar. The gasoline-oil business was the most profitable special side line. Grinding was also profitable. On an average, with a volume of business below 125,000 bu., there was a negative economic profit; with a business of 200,000 bu. there was a profit of 1 ct. per bushel; and with 275,000 bu. a profit of 1.5 ct.

***Agriculture and the trade cycle: Their mutual relations, with special* reference to the period 1926–1931**, J. H. Kirk (*London: P. S. King & Son, 1933, pp. XIII+272, figs. 17*).—Part I, The Effects of Trade Cycles on Agriculture (pp. 1–127) describes and analyzes the effects upon agriculture of disturbances to the world economy, especially in their cyclical bearing, in chapters on the conditions of agricultural supply, aspects of the demand for agricultural produce, the marketing of staple produce, agricultural crises, and problems of overproduction.

Part 2, The Responsibility of Agriculture for Trade Cycles (pp. 129–240), discusses briefly the following theories of the trade cycle: Monetary, errors and anticipations, recurrent overproduction, savings and investment, inventions and innovations, disequilibrium between organic and inorganic goods, the 3½-year meteorological cycle, and the 8-year meteorological cycle. It also discusses the fluctuations in agricultural activity and the cycle of the production period.

Appendixes include notes on savings and investment, an analysis of farm costs, the elasticity of demand for agricultural produce, marketing costs of agricultural produce, and carrying costs of stocks of raw produce.

The American farmer and the export market, A. A. Dowell and O. B. Jesness (*Minneapolis: Univ. Minn. Press; London: Oxford Univ. Press, 1934, pp. VI+269, figs. [6]*).—"This book deals with present day economic nationalism in relation to American agriculture." The aim of the authors "has been to show the place of foreign markets in American agricultural trade and to consider the consequences of abandonment or drastic curtailment of these outlets." The subject is discussed under chapter headings as follows: Farming as an Industry, Our Farm Resources, Crop Production, Livestock Production, The Export Surplus, Will Population Growth Absorb the Surplus, Can We Hope for Increased Consumption, Will the Removal of Submarginal Land Solve the Surplus Problem, The Farmer is Becoming More Efficient, The Possibility of Shifting From Export to Import Crops, Is National Self-sufficiency Practicable, The Place of the American Farmer in World Competition, Tariff Fundamentals, Protection of Farm Products, International Debts a Part of the Export Problem, Governmental Policies in International Trade, and What of the Future.

Prices of farm products in northwestern Indiana, L. Robertson and F. V. Smith (*Indiana Sta. Bul. 387 (1934), pp. 28, figs. 23*).—This is a study of the differences in average prices, 1927–31, of farm products between localities in 12 counties in the northwestern part of Indiana and between these counties and Clinton County and the State as a whole. Charts show for the 12 counties, by townships, (1) the bushels of corn, oats, wheat, and rye produced per acre and the percentage feed grain production was of feed grain requirements; (2) the price zones for corn, oats, wheat, rye, eggs, poultry, butterfat, and hogs;

(3) the seasonal variations, average and in townships, with deficit and with heavy surpluses of feed grain production in the price of corn and oats; and (4) seasonal variations in the 12 counties and in Indiana in the price of wheat, butterfat, and veal calves. Other tables and charts show the average, 1921–31, monthly variations in prices of onions, all years, and in years of small and large crops, and the monthly prices, 1927–31, of peppermint oil. The prices of steers, potatoes, and cucumbers are dealt with in less detail.

The proximity of a large industrial population has caused a different relationship between prices of farm products in the 12 counties than in other areas farther from such development. In general, the relationships in the 12 counties encourage the production of such products as fluid milk, eggs, poultry, vegetables, potatoes, and perishable fresh fruits, thus crowding out such products as beef cattle, cash grain, sheep, and hogs. Important local differences in price relationships exist between localities in the 12 counties as a result of production, demand, and location.

From 1927 to 1931 corn and oat prices in the 12 counties averaged highest in townships of deficit feed grain production, but were higher in townships having heavy surpluses than in those having light surpluses. Seasonal variations averaged less in townships of heavy surpluses than in those of deficit.

Crops and Markets, [May 1934] (*U.S. Dept. Agr., Crops and Markets, 11 (1934), No. 5, pp. 145–176, figs. 3*).—Included are tables, reports, summaries, charts, etc., of the usual types covering crop and livestock estimates, market reports, and the price situation. A table is included showing the indexes 1912–14=100), March 1, 1934, of farm real estate values, by States and geographic divisions, with comparisons for the years 1920 and 1925–33.

International yearbook of agricultural statistics, 1932–33 (*Internatl. Inst. Agr. [Roma], Internatl. Yearbook Agr. Statis., 1932–33, pp. XXXVI+794*).—This is a continuation of the series previously noted (E.S.R., 69, p. 458).

RURAL SOCIOLOGY

National policies affecting rural life (*Amer. Country Life Conf. Proc., 16 (1933), pp. [4]+152*).—This is the proceedings of the sixteenth American Country Life Conference, held at Blacksburg, Va., August 1–4, 1933. It includes (1) the following addresses and papers: National Policies Affecting Country Life, by H. C. Taylor (pp. 6–30); World Agriculture—Its Significance for Rural America, by H. A. Wallace (pp. 31–41); The National Policy Needed, by N. Thomas (pp. 42–51); Agricultural World Economy, by W. McClure (pp. 113–125); International Debts and Monetary Policies, by L. Pasvolsky (pp. 126–130); and World Trade Barriers and American Agriculture, by L. R. Edminster (pp. 131–144); (2) round table reports presented by their chairmen as follows: A National Policy for Rural Education, by J. E. Butterworth (pp. 52–62); National Policies Affecting Health and Welfare, by K. F. Lenroot (pp. 63–85); National Policies Affecting Land Use, by L. C. Gray (pp. 86–103); and International Policies Affecting Rural Life, by A. Hobson (pp. 104–112); and (3) a brief report on the student section conference, by E. L. Kirkpatrick (pp. 145–149).

Research in agricultural income: Scope and method, edited by J. D. Black (*Social Sci. Res. Council Bul. 6 (1933), pp. [4]+158*).—This is one of a series of reports on scope and method of research in the various subfields of agricultural economics and rural sociology. It is designed to be of service to research workers and administrative officers. It should be helpful in the delineation of problems, the development of method and procedure, and the interpretation of data.

A new land-use program: The place of subsistence homesteads, M. L. Wilson (*Jour. Land and Pub. Util. Econ., 10 (1934), No. 1, pp. 1–12*).—This article describes briefly the plan of the Government under Sect. 208 of the National Industrial Recovery Act, the previous experiences in the United States and foreign countries with back-to-the-land movements, and the economic bases of the present plan.

Trade and social habits of rice farmers (*Arkansas Sta. Bul. 297 (1934), pp. 77, 78*).—The influence of the automobile and good roads on the trade and social habits of rice farmers is traced.

Social organization in the fruit area (*Arkansas Sta. Bul. 297 (1934), pp. 101–103*).—The conclusions from this study are that the major interests and needs of the farm people in Washington County are not satisfactorily met and that the development of farmer leadership is necessary to more effective community organization.

Relationships of open-country families of Onondaga County, New York, to socio-economic areas, villages, and cities, A. M. Paxson (*[New York] Cornell Sta. Bul. 584 (1934), pp. 71, figs. 17*).—This is one of a series of studies dealing with the social and economic areas of counties in central New York (E.S.R., 71, p. 270).

A comparison of the church areas with the grocery areas reveals that the areas are small for both of these services. Approximately the same proportion of families residing in the various church and grocery areas obtain the respective services in the area center. Church and grocery areas probably conform more nearly to the old community areas than do most of the other areas studied.

"The far-reaching influence of the city of Syracuse on the economic life of the county becomes quite apparent when the special service areas of the county are examined. The city practically dominates the county for the purchase of specialized types of commodities. It is also used extensively for obtaining other specialized types of services such as banking and the purchase of drugs, as indicated by the large proportion of families in the service areas of towns and villages, who obtain these services in Syracuse.

"The city is used more for the economic than for the social services. This is most pronounced in the case of the church areas, an analysis of which reveals that rural families tend to patronize open-country churches more than city churches when they do not go to church in the center of the area in which they reside."

In the hardware, motion-picture, drug, banking, work-clothes, and garage areas there is a decided tendency for the families who do not obtain the service which the area represents in the center of the given area in which they reside to go to Syracuse for this service.

The purchase of commodities by mail order does not appear to have appreciably weakened the areas for work clothes and hardware. This type of buying appears to be most used in the areas of the small places.

The questionnaire schedules are appended.

Movement of population to and from New York State, W. A. Anderson (*[New York] Cornell Sta. Bul. 591 (1934), pp. 35, figs. 5*).—The author has analyzed the composition of the population of the State of New York from the point of view of native country and State, and indicated the results of the change of population between it and other local divisions of the country.

Of New York's total population in 1930, 62 percent were born in the State, 11 percent were born in other States, and 26 percent were foreign-born. The population of New York State increased 73.2 percent from 1900 to 1930. The increase in the foreign-born population of New York from 1920 to 1930 was

408,520, or 14.3 percent, but the foreign-born migrants to New York settled chiefly in urban territory.

Of the 9,207,995 persons native to the United States, and living, in 1930, in New York State, 85 percent were born in the State; 15 percent had migrated to the State from other States. More than one-half of these migrants to the State came from States that border on New York, and the Middle Atlantic, the New England, the East North Central, and the South Atlantic divisions contributed 88 percent. The native negroes came to New York chiefly from the Southeastern States. Females came in the ratio of 100 to 97 males.

Twenty-three percent of the migrants from New York settled in western States, especially California, where their number totaled 147,189 persons. Males migrate from New York in the proportion of 103 to every 100 females. American-born whites of native-American parents leave New York in a larger proportion than do the native whites of foreign or mixed parentage. Of the migrants from New York, 84 percent settle in the Middle Atlantic, the New England, the East North Central, and the Pacific divisions.

As a result of the migration of native-American persons to and from New York State, New York lost, in the sense of this study, 138,742 inhabitants. The net loss through migration was 180 males to every 100 females. The loss was also from the rural people, especially the rural nonfarm class.

An important social problem of the State of New York is the assimilation of approximately one-fourth of the total foreign-born population residing in the United States. Not only must New York absorb a large proportion of the Nation's foreign-born inhabitants, but there is the problem of absorbing a net increase, as of 1930, of 210,000 negroes who have migrated chiefly from the South Atlantic division to the industrial cities of the State. Economic conditions in the South have speeded this migration.

This study shows that there is more stability in the farm population, as far as interstate migration is a measure, than in the rural nonfarm or the urban population. Of the rural farm population born in the State 87 percent were living there in 1930, as contrasted with 84 percent of the native urban-born and 81 percent of the rural-nonfarm-born inhabitants. Problems of community organization, economic cooperation, and institution building among farm people do not present such difficult situations as the result of mobility as among the urban and rural nonfarm classes. To attach these more fluctuating classes to the constructive social agencies and build their interests into those of the community-building agencies calls for careful social planning.

The rural neighborhoods of Otsego County, New York, 1931, D. Sanderson and H. F. Dorn ([*New York*] *Cornell Sta. Mimeogr. Bul. 2* (*1934*), *pp. 20, fig. 1*).—This is a resurvey of Otsego County to determine what changes, if any, had occurred in the social organization of its rural life during the preceding decade (E.S.R., 50, p. 492).

The rural homes of city workers and the urban-rural migration, L. B. Tate ([*New York*] *Cornell Sta. Bul. 595* (*1934*), *pp. 53, figs. 30*).—The purpose of this study was to find the extent and rapidity of the urban-rural migration, or backflow, of city-workers' households into the area adjacent to Rochester, N.Y., to ascertain the stimulating factors in this movement, to discover the characteristics and living conditions of those involved, and to determine, if possible, the advantages and disadvantages for the individual households and for society.

This backflow has occurred mainly during the past decade, and has been taking place with an increasing rapidity, facilitated by the automobile and improved highways.

Predominant in this movement is the middle-aged industrial worker with a household of 2, 3, or 4 members and an income of less than $2,000. He produces a few vegetables and fruits for home use and occasionally for sale, but is not a serious competitor of the farmer. He is trying to get away from high property values, rentals, and taxes, and the noise, congestion, and dangers of the city, and out into a rural environment with its lower cash requirements, greater opportunity for self-sufficing enterprises, and other advantages.

The movement into rural homes is pushing the periphery of the city beyond its corporate limits and extending its zone of influence. It is bringing about the establishment of business centers on the edge of the city and the extension of delivery services, and therefore an expansion of the trade area. At the same time it is bringing the rural area into a new relationship with the city and breaking down the old idea that a rural area is one of isolation and a minimum of conveniences. Such a movement shows possibilities of increasing home ownership, thereby insuring greater stability and permanency, a more reliable labor supply, and a special interest in such things as public improvements and the problems of social control. Combined with favorable housing legislation for the small owner, this movement has possibilities of offering greater security in times of temporary maladjustment, but inasmuch as the worker involved relies mainly upon his work in industry for the funds which supply him with many of the comforts of life, it is doubtful whether he could be self-sustaining over any prolonged period of time without serious impairment to his standard of living.

"For those who are interested in planning the metropolitan region, however, the urban-rural migration is a problem. While it includes a relatively small number of people, as compared with the total population of the city, it is, nevertheless, transferring or extending traffic density from city streets to the arterial highways leading into the city and creating a need for future planning along this line. It is transferring school population from the city to the rural and suburban districts, thereby adding new life to the local schools but at the same time creating a need for additional school facilities. It is bringing about a new demand for the expansion of the public utilities which many of the households have had access to in the city, and inasmuch as these usually cost just as much or more when extended into the rural areas, it is not likely that the households with a maximum of modern conveniences will live any cheaper than they did in the city. From the standpoint of social organization and civic planning the movement presents an awkward situation. Without regard to political subdivisions and boundary lines, it tends to be bringing about the creation of a more or less natural area which is essentially 'urban' or metropolitan."

Rural-urban migration in North Carolina, 1920 to 1930, C. H. HAMILTON (*North Carolina Sta. Bul. 295 (1934), pp. 85, figs. 27*).—This is a statistical study of data collected by the Bureau of the Census, U.S. Department of Commerce, and the Bureau of Vital Statistics of the North Carolina Board of Health. The bulletin is divided into two divisions. In the first, migration within the State by age, sex, color, and residence groups is analyzed. The second is an analysis of interstate migration from 1870 to 1930 and is based upon State of birth data of the various census reports.

During the decade 1920–30 approximately a quarter million people shifted from the farms to the towns and cities of North Carolina. The majority of the net migration was found in the group who were from 10 to 20 years of age in 1920 and from 20 to 30 in 1930. More females than males and more colored than white people left the farms for the towns and cities. Colored migrants, male and female, were more likely to leave the State than were white

people. Similarly, males, white and colored, were more likely than females to leave the State. A very small amount of net migration from farms is indicated in the middle-aged group.

The State as a whole just about held its own by interstate migration during the decade, gaining a few young people, losing some older young people, gaining middle-aged people, and losing some old people. Negro migrants to the State came from South Carolina, and negro migrants from the State went to the large northern and industrial centers. White migrants to the State came from more scattered southern States than did the negroes, but white migrants from the State were more likely than negroes to settle in nearby States, particularly in Virginia. Migrants from North Carolina, farming in 1930, were more likely to have gone south and west than were migrants from North Carolina who lived in cities in 1930. An increasing percentage of the population of North Carolina is composed of migrants from other States. A decreasing percentage of the people born in North Carolina leave the State. North Carolina holds its native-born stock better than all States except California, Texas, New York, and New Jersey.

The economic significance of the non-farming rural population in northwestern Indiana, L. ROBERTSON (*Indiana Sta. Bul. 388 (1934), pp. 28, figs. 13*).—The rural districts of northwestern Indiana, on account of nearness to industrial cities, have a large and increasing population of nonfarming families. In four selected rural areas in Lake, Porter, LaPorte, and St. Joseph Counties, where the problem connected with the nonfarming rural population was studied in 1933, there were 578 nonfarming out of a total of 1,263 families. Of the 578 heads of nonfarming rural families 86 had employment in the townships but not at farming, 255 worked in cities outside the townships, 165 were unemployed, 63 were retired, and 9 were of unknown occupation. Two-thirds of the 578 nonfarming rural families came into the four areas after January 1, 1929.

Economy was the principal motive bringing the nonfarming population to the country. Forty-seven percent of the reasons given by the 578 families for living in the country had to do with cheaper rent, or opportunity to raise garden or other food, or to buy food more cheaply.

In 1932 nonfarming families did an average of six days of farm work per family.

The 578 nonfarming rural families received an average of $22.67 public poor relief per family during the year ended in the spring of 1933. The average public school costs for the year 1932–33 were $72.85 per nonfarming rural family.

In three areas the maximum average extra taxes resulting from the nonfarming rural population, without considering mortgage exemptions, amounted to about $25 per family, or approximately 22 percent of the $116.99 extra public costs for schooling and poor relief per family in these three areas. From the standpoint of the nonfarming families, residence in the country is, in most cases, an advantage, largely on account of greater economy.

Rural factory industries, T. B. MANNY and W. C. NASON (*U.S. Dept. Agr. Circ. 312 (1934), pp. 35, figs. 3*).—Continuing previous work (E.S.R., 68, p. 695), this subject was studied from the viewpoints of unemployment and part-time farming. Manufacturing units in 15 States east of the Missouri and Mississippi Rivers were included.

Factories in small towns or in the open country, it is concluded, offer five different sources of income to nearby farm people: (1) Selling farm products as raw materials for manufacturing purposes; (2) full- or part-time employment at the factory; (3) performing certain steps in the manufacturing

processes in their own homes or small shops; (4) earnings from investment in the factory; and (5) selling foodstuffs or other farm products on local markets, the demand for which is due to the presence of the factory.

The cases studied indicate that the effect of such factories upon standards of living, schools, roads, and other socio-economic facilities has been good as a general rule. The factories appear to have been of some influence in keeping some of the local young people on farms while they are working in these plants.

The rural churches of Allegany County, W. G. Mather, Jr. (*[New York] Cornell Sta. Bul. 587 (1934), pp. 31, figs. 13*).—A detailed compilation was made of the annual reports of each church of the 7 leading denominations in the county from 1900 to 1930. From this and other data it is concluded that the churches of this county must adapt themselves to a situation in which they face decreased revenues and declining memberships. A choice must be made between small churches, poorly manned and equipped, but responsive to the denominational urge, and larger churches, better constructed, manned, and equipped.

Where small churches must be perpetuated, advantage may be gained by associating them one with another or with a larger church at the natural center of the community. Whatever method is chosen, provision must be made to meet the needs of the population, taking into account the steadily rising culture requirements of the people whom the churches serve.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1933–34, M. A. Agnew (*U.S. Dept. Agr., Misc. Pub. 180 (1934), pp. IV+110*).—This is the usual list (E.S.R., 69, p. 142).

FOODS—HUMAN NUTRITION

Nutrition laboratory, F. G. Benedict (*Carnegie Inst. Wash. Yearbook, 32 (1932–33), pp. 167–178*).—This annual report (E.S.R., 69, p. 142) includes as usual brief outlines of investigations in progress and summaries of papers published during the year.

Experimental animal nutrition (*Arkansas Sta. Bul. 297 (1934), pp. 103–114*).—This review of the contributions of the station to the field of animal nutrition covering the period from 1920, when nutritional investigations were begun with a study of the nutritive value of the Georgia velvetbean, through 1933 is presented under the following general topics: Amino acids in nutrition, dietary requirements for fertility and lactation, discovery of a vitamin essential for reproduction, biochemistry and pathology of deficiency diseases, and role of vitamin B in infant nutrition.

[Nutrition studies at the Iowa Station] (*Iowa Sta. Rpt. 1933, pp. 28, 29, 116, 119–121*).—Progress reports (E.S.R., 67, p. 473; 69, p. 143) are given by J. A. Schulz and B. H. Thomas on the effect of the ingestion of fluorides on the teeth, bones, blood, and tissues of albino rats; by P. M. Nelson and P. P. Swanson on differences in nutritive value of diets in which dried canned beef muscle and dried canned pork muscle served as sources of dietary protein; by Nelson, B. Lowe, W. F. Coover, and J. H. Buchanan on the relationships of the physical and chemical characteristics and constants of lard to its culinary value; and by L. J. Peet and L. E. Sater on the sterilization of fruit juices and the cooking of fruits and vegetables in the apparatus previously described (E.S.R., 67, p. 493).

[Food utilization studies at the Massachusetts Station], C. R. Fellers et al. (*Massachusetts Sta. Bul. 305 (1934), pp. 44, 45*).—In addition to a number of studies previously noted, this progress report (E.S.R., 69, p. 747) includes summaries of the utilization of cull onions by pickling, the vitamin C content of commercial tomato juices, the effect of fertilization, canning, and quick freezing on the vitamin A and C content of asparagus, oven canning, the cause of mold development in maple sugar, and vitamin A and C determinations on maple products.

Cooking and canning meats.—Part 5, Meat on the farm, E. Latzke (*North Dakota Sta. Circ. 51 (1934), pp. 63, figs. 21*).—The methods and recipes in this bulletin, which has been prepared for the use of homemakers, are based upon the extensive experimental work carried on in several of the experiment stations and the Bureau of Home Economics, U.S.D.A., under the auspices of the cooking committee for the National Cooperative Meat Investigations.

A distinctive feature of the publication is the arrangement of subject matter by types of cookery rather than kinds of meat. The first few pages are devoted to the place of meat in the diet, its selection at the market and care in the farm home, and the general principles of meat cookery. General directions are then given for roasting meats, with specific directions for beef, veal, fresh pork, cured ham, lamb and mutton, and for roasting various meats in a dutch oven. Other topics include broiling and pan broiling steaks and chops, cooking the less tender cuts of meats, meat soups, cooking miscellaneous meats, poultry and game, carving hints, canning meat, and the use of meat fats. A few recipes for the use of lard and about 50 special meat recipes are included.

The use of lard in cookery, J. A. Cline (*Missouri Sta. Bul. 335 (1934), pp. 31, fig. 1*).—Following a brief discussion of lard from the standpoint of its production, classification, composition, nutritive value, characteristic properties, and care, general directions and basic recipes for its use as a shortening agent for various types of batters and doughs are given, together with tested recipes in which lard is the shortening agent. A list of 24 literature references is included.

The digestibility of crust and crumb of white bread in vitro, E. O. Greaves and A. F. Morgan (*Cereal Chem., 11 (1934), No. 2, pp. 228–230*).—In vitro trypsin digestion experiments on the lower and upper crusts and crumb of white bread, using both the Van Slyke method and the Sörensen formol titration method (as modified by Northrop for amino nitrogen content) are reported, with results indicating that the crumb is more readily digested than the crust and the lower crust than the upper crust. These findings, together with those of Morgan (E.S.R., 65, p. 789) that the heating of gluten and casein to 150° C. decreases their nutritive value, and of Kon and Markuze (E.S.R., 67, p. 620) that rats fed the crumb of bread grow faster than those fed the crust, lead to the authors to comment as follows:

"In the past it has been the custom to feed infants the crust of bread in preference to the crumb because it was thought that since some of the starch of the crust is partially dextrinized it may be more easily digested. If in vitro digestion data apply at all to human digestion problems, since the infant and young child require a high protein diet of easy digestibility it would seem to be advisable to feed the crumb rather than the crust because of the more digestible character as well as higher biological metabolic value of the proteins of the crumb."

An automatic shortometer, C. H. Bailey (*Cereal Chem. 11 (1934), No. 2, pp. 160–163, figs. 2*).—In this contribution from the Minnesota Experiment Station an automatic shortometer for measuring the breaking strength of cookies

is described and illustrated. "It consists of a compression spring scale or 'balance' provided with supports for the cookies. A striker member exerts force on the center of the cookie. This force is applied by a lever which is drawn downward by a cord, which, in turn, is being wound over a motor-operated windlass. At the instant that the cookie breaks, the entire moving system is stopped by opening the electric circuit through a friction switch. The maximum force can then be noted on the dial of the scale. The average probable error of the means of tests replicated 20 times was 2.41 percent of the average of the means."

Philippine rice-mill products, with particular reference to the nutritive value and preservation of rice bran, A. P. West and A. O. Cruz (*Philippine Jour. Sci., 52 (1933), No. 1, pp. 78, pls. 10, fig. 1*).—This report describes the cultivation and milling of rice in the Philippine Islands, with composition and uses of such byproducts as rice straw, starch, and hulls, as well as polished and unpolished rice, and discusses the composition, nutritive value, deterioration, and preservation of rice bran with a view to its wider use as a human food.

According to the Philippine process of milling rice, the hulls are first removed, leaving the unpolished rice. This is passed through a combined scraping and polishing process which removes the outer portion of the kernel, together with the embryo. The portion removed is known as rice bran, rice polishings, or tikitiki, and consists of the seed coat, embryo, and most of the outer (aleurone) layer of the kernel, together with some of the starchy material beneath the aleurone layer, but should contain no hulls. In practice millers sometimes mix ground rice hulls with the bran in order to dispose of the hulls with profit, but bran thus adulterated is not suitable for consumption. In the United States the scraping and polishing of the unmilled rice are done separately, the first product or scrapings constituting the bran and the second the polishings.

The data on the composition of rice bran and its products include, in addition to a compilation from the literature, hitherto unpublished data from the Philippine Bureau of Science. Studies by Hermano show that rice bran cures polyneuritic pigeons in doses of 0.5 g, and loses none of its activity on heating at a temperature of 105° C. for 3 hr. In similar curative tests on pigeons, 17.5 g of tikitiki extract prepared by the method of Wells (E.S.R., 46, p. 569) was equivalent in vitamin B_1 potency to 10 mg (1 unit) of the international standard activated clay. Vitamin A was shown to be present in the rice bran, for xerophthalmia in rats was cured and growth restored on 0.2-cc daily doses of rice bran oil prepared by extracting the bran with ether and heating at a temperature of 105° to remove the solvent. Sterility in rats on vitamin E-deficient diets was also prevented by the same quantity of the oil. Negative results were obtained in vitamin D tests with nonirradiated and positive tests with irradiated oil.

The proteins of rice bran are shown to be of high biological value, comparing favorably with meat protein. Calcium and phosphorus are not well balanced in the bran. Analyses by Tirona gave a P_2O_5 content of 5.09 and CaO of 0.06 percent. A list of Philippine vegetables with high calcium and low phosphorus content is given, and it is suggested that the use of these vegetables in a ration containing rice bran would tend to balance the Ca : P ratio.

To prevent the rapid deterioration of rice bran, the authors suggest heating the bran at a temperature of 105° for 3 hr. and storing the material in moisture-proof wrapping such as cellophane.

An increase in the use of rice bran in the Philippine diet is urged. "For the poorer classes who live on a diet composed principally of polished rice and more or less deficient in fats, proteins, and vitamins, the use of rice bran as a food would serve to supply, to a considerable extent, the present dietary deficiency. It would not only prevent sickness and death from beriberi, but the health of the people would be generally improved. Moreover, by utilizing this domestic byproduct of the rice mills, the Filipinos would be developing the natural resources of their own country, and the importation of rice and other foodstuffs from foreign countries would be greatly diminished."

The report is illustrated by photographs and diagrams.

The nutritive value of the pinto bean in the diet of Mexican children, H. B. BURTON and C. L. WILKINS (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *13* (*1933*), *pp. 16–18*).—A limited amount of evidence is presented indicating that pinto beans contain at the most only traces of vitamin A. It is suggested that the underweight, underheight, and poor nutritive condition of a group of Mexican children observed in an earlier study may be attributed in part to the important place which the pinto bean occupies in the Mexican diet.

The physico-chemical changes produced by the cooking of potatoes, M. D. SWEETMAN (*Amer. Potato Jour.*, *10* (*1933*), *No. 9, pp. 169–173; abs. in Maine Sta. Bul. 369* (*1933*), *p. 587*).—In this contribution from the Maine Experiment Station the author discusses, with references to the literature, the most completely studied chemical and physical transformations which take place in potatoes on cooking, including gelatinization of the starch, solution of pectic substances, softening of cellulose, coagulation of the protein, and caramelization of sugar.

"Cooking of potatoes does not cause the bursting of cell walls, but permits ready mechanical disintegration of the tuber tissue by separation of cells. The process is characterized by such physicochemical changes as partial gelatinization of the starch, the solution of some of the pectic substances, the increased digestibility of the cellulose, the coagulation of most of the protein, and more or less caramelization of the sugar. Probably constituents present in smaller proportions are also important in their effects on culinary quality."

Cooking quality of potatoes, M. D. SWEETMAN and P. S. GREENE (*Maine Sta. Bul. 369* (*1933*), *p. 558*).—This progress report (E.S.R., 68, p. 559) deals with the properties of potato starches in relation to cooking quality.

On the carotenoids and some lipoids of Ipomoea reptans (L.) Poir [*trans. title*], M. ISHII (*Jour. Soc. Trop. Agr.* (*Nettai Nôgaku Kwaishi*), *5* (*1933*), *No. 2, pp. 192–197, fig. 1*).—*I. reptans*, widely distributed as a summer vegetable in Formosa, contains 5.5 percent ether extract, 5 percent total nitrogen, and 14.3 percent crude fiber in dry substance. The investigations were made chiefly on the carotenoids and lipoids in the ether extracted part. As to carotenoids, β-carotene and xanthophyll were obtained separately in crystalline form; a trace of taraxanthin was recognized. Quantitative separation and colorimetric estimation gave on a dry matter basis β-carotene, 0.033 percent; xanthophyll, 0.090 percent; and ester-form-xanthophyll, 0.006 percent. In respect to lipoids, *n*-hentriacontane (m.p. 67°), sitosterol (m.p. 136°), sitosterol glucoside (m.p. 280°), and a higher alcohol (m.p. 267°) were separated. It is concluded that this vegetable is a valuable food for tropical residents, due to its large content of carotenoids, especially β-carotene, which acts as vitamin A.—(*Courtesy Biol. Abs.*)

Refrigerator ice creams, E. LATZKE (*North Dakota Sta. Circ. 53* (*1934*), *pp. 14, figs. 8*).—The principles involved in the making of refrigerator ice creams are first explained, with directions for the use of gelatin, custard, and egg

white as materials to increase the bulk and improve the texture of the frozen product. Three standardized vanilla cream recipes are then given as foundation recipes from which numerous other recipes affording variation in flavor are developed. Recipes are also included for chocolate, butterscotch, and fruit sauces, and suggestions are given for varying the service of refrigerator creams.

Protein, minerals, and vitamins of evaporated milk, F. E. Rice (*Amer. Jour. Pub. Health, 24 (1934), No. 3, pp. 194–198*).—This is a brief discussion, with numerous references to the literature, of the nutritive value of evaporated milk from the standpoint of protein, minerals, and vitamins, and of its sterility, value in special conditions, stability to freezing, flavor, and cost.

Preservative action of spices and related compounds against yeast fermentation, J. W. Corran and S. H. Edgar (*Jour. Soc. Chem. Indus., Trans., 52 (1933), No. 21, pp. 149T–152T*).—The effects of various spices, condiments, herbs, and their oils on the fermentation of beer wort by baker's yeast at room temperature were studied under varying conditions of concentration and length of time. Of the spices ground mustard was the most effective preservative, followed by cloves and cinnamon, with little or no preservative action for the other spices tested. The herbs examined, which included thyme, bay leaves, marjoram, savory, and rosemary, appeared to stimulate yeast action, and this was also true of black pepper. The volatile oil of mustard was by far the strongest preservative of the oils, followed by cinnamon oil and then by oils of cloves, thyme, and bay leaves, which were of approximately equal potency. The other oils tested were of little or no value. Mustard oil in a concentration of 500 p.p.m., which is about the minimum amount used in salad dressing and mayonnaise, proved to be a more effective preservative as thus tested than sulfur dioxide and benzoic acid in the concentrations allowed (England) for fruit juices, 600 and 350 p.p.m., respectively.

With a concentration of yeast of 0.5 percent and of preservatives of 1 in 10,000, the loss of glucose with volatile oil of mustard was 0, with sodium benzoate 82 percent, with potassium metabisulfite 81, and with no preservative 82 percent. It is noted that the concentration of sulfur dioxide used is of the same order as that allowed in sweetened mineral water and soft drinks.

Destruction and survival of microorganisms in frozen pack foods, J. A. Berry (*Jour. Bact., 26 (1933), No. 5, pp. 459–470, figs. 3*).—In this contribution from the Seattle frozen pack laboratory of the U.S.D.A. Bureau of Plant Industry, data are reported showing that the microbiological content of small fruits in sucrose solution stored at −2°, −4°, −7°, −10°, and −20° C. tends to decrease most rapidly at the higher temperatures, the reductions in strawberries, for example, being 60 percent at −20° and 89 percent at −10° in 4 mo. There is evidence that CO_2 from respiration of the fruit is responsible in large part for the destruction of micro-organisms. The airtightness of the container apparently affects the microbial death rate. In vegetables preserved at −10° lactobacilli and "colon" organisms have been found to persist for 2 yr. Under aerobic conditions *Cladosporium* sp. and *Torula* sp. will grow at −2°, and *Pseudomonas* sp. at −4°. Yeast cells in wort exposed to −10° are largely destroyed in 3 days when the medium freezes. If the medium remains liquid, approximately 50 percent are alive after 3 days.—(*Courtesy Biol. Abs.*)

What Missouri housewives know about brands, J. N. Amburgey and J. V. Coles (*Food Indus., 6 (1934), No. 4, pp. 170, 171, fig. 1*).—This brief report summarizes information obtained by the questionnaire method from 400 Missouri homemakers on farms, in small villages, and in cities of less than 50,000 population on the knowledge and use of brands in food purchasing.

Relation of food to length of life, H. C. Sherman (*Carnegie Inst. Wash. Yearbook, 32 (1932–33), pp. 317–319*).—This is the first progress report of an extension, under the auspices of the Carnegie Institution of Washington, of the long-continued investigation of the author and his associates which has already shown that more rapid growth and a significant extension in length of life result from slight improvements in diets already adequate. "The further development of our study of the relation of food to length of life presents three aspects: (1) Attempts to ascertain just what chemical elements and compounds are concerned in such extension of the average length of life as was induced in the experiments above noted; (2) investigation as to the practicability of further extension of the average life cycle or adult life expectation by further chemical improvement in the already adequate food supply; (3) experiments of similar character with diets in which the articles of food are more varied and are used in proportions more directly modeled upon ordinary human food supplies."

Weight, height, and nutrition: Observations from the Isle of Ely, T. C. Lonie (*Jour. Hyg. [London], 34 (1934), No. 1, pp. 131–140*).—Height and weight data are summarized from measurements of over 5,000 children from 5 to 14.5 yr. of age in the Isle of Ely, Cambridgeshire, England.

In discussing the method of collecting the data, the author calls attention to various sources of error in the use of spring machines of the "personal" weighing type. In the present investigation a short lever machine of known accuracy was used. The children were weighed and measured in indoor clothing without shoes.

In weight the boys exceeded the girls up to the eleventh year, after which the girls were heavier than the boys. In both sexes with increase in age there was a greater scatter of the observations around the mean, especially in weight.

Except at heights of 56.75 and 57.75 in. the boys were heavier than the girls at any height. The weight: height ratios were from 0.02 to 0.04 higher on the average than for the girls. Commenting upon the use that can be made of weight-height data, the author expresses the opinion that "in whatever way they are utilized, weight and height data can never be more than a rough index of nutrition, though a very necessary one. They do, however, give a picture of the 'size' of the average child, and, even if they are not malnourished, those that differ widely from the scale are not normal and their condition requires further investigation. Moreover, an accumulation of such data for different areas in this country ought to give indications of racial and no less important economic and environmental differences which, if the influences can be elucidated, must guide the community in its strivings after the general betterment of the race."

A comparison of the data in the present investigation with observations from other parts of the country indicates the superiority of the Isle of Ely children in both height and weight, particularly at the older ages.

On the control of obesity, A. H. Douthwaite (*Brit. Med. Jour., No. 3824 (1934), pp. 690–702, figs. 5*).—This is a general discussion of the dangers, causes, and treatment (dietetic and drug) of obesity, with comments on the dangers involved in the use of drugs such as α-dinitrophenol and dinitro-o-cresol.

"In view of the fact that it is possible to control obesity even if of frankly endocrine origin by means of dieting alone, it is clearly undesirable to use a drug which is poisonous in doses only a little above those which are effective. In obstinate cases its use may be countenanced, but only when strictly con-

trolled by the doctor, who must be guided by knowledge of the basal metabolic rate."

The diet of Texas school children, J. WHITACRE (*Texas Sta. Bul. 489 (1934), pp. 44, figs. 6*).—This bulletin reports the results of a study of the dietary habits of individual children of school age from three race groups in three widely differing agricultural regions of Texas. The data were obtained in 1927–29 in the form of written records of all food eaten for a week in the spring and another in the winter from 993 white children in three counties, 471 negro children in two counties, and 153 Mexicans in one county of the State.

As illustrative of the type of data secured, six typical diet records are given, one of the poorer and one of the better diets for each race selected to represent both sexes, the two seasons, and different ages. The data as a whole are presented and discussed with reference to season and region, race, sex, and occupation and are further evaluated as a whole by a comparison of the estimated average values with commonly accepted standards and individually by the use of a diet score card similar to but not identical with those used in previous studies conducted by the Virginia (E.S.R., 57, p. 387), Massachusetts (E.S.R., 59, p. 790), Florida (E.S.R., 64, p. 284), and South Carolina (E.S.R., 64, p. 285) Stations.

"The outstanding feature in the comparisons of diets [in the present investigation] is the striking similarity between the diets in the different seasons, regions, and races. Records from either season in any region give equally satisfactory information as to the kinds of foods which the children ate. Racial differences in the kinds of foods used were less marked than is commonly supposed. While in general, the white children had a better diet than the Mexican, and the Mexican than the negro, all appear to have had a deficiency in the use of milk, fruits, vegetables, and whole cereals. There seemed a sufficiency of protein-rich foods and a relative overabundance of refined cereal foods. The most noteworthy racial difference is in the use of coffee and tea, three times as many of the Mexicans drinking these beverages as did the white or negro children. Coffee and tea tended to crowd milk out of the diet.

"Girls had slightly better diets than boys, due to more liberal use of milk, butter, fruits, and vegetables. Among white children, those of 8 and 9 yr., boys of 14, and girls of 13 had better diets than those of other ages. The diets of negroes, however, were progressively better as the children advanced in age. Children of the farmer, business, and labor groups had a definitely lower consumption of milk, fruits, vegetables, whole cereals, and coffee and tea than the professional group had."

The comparison of the diets in the present study with those reported from other States showed a striking similarity in dietary habits, particularly in low scores for milk, fruits, vegetables, and whole cereals.

The author concludes that "the findings of this study indicate that some other factor (or factors) than racial habits, season of the year, or differences in the supply of locally-produced foods exercises a greater influence in determining what kinds of foods school children eat. The findings further suggest that there are good reasons for continued emphasis upon the liberal use of milk, fruits, vegetables, and whole cereals in the diet of growing children."

Diet table in a private boarding school of two hundred boys, T. N. HORAN (*Jour. Amer. Med. Assoc., 102 (1934), No. 11, pp. 836–838, figs. 5*).—The method followed at a private school for boys near Detroit, Mich., for correcting underweight of the students by diet is discussed from the standpoint of diet and psychology, both individual and group. Some of the apparent causes of under-

weight observed are listed, including a fundamental distaste for foods high in calorie value among underweight subjects, anatomical anomalies, overactivity, chronic appendicitis, and poor posture. "The actual dieting is preceded by a period of relative fasting, followed by a rapid increase in food to as high as 5,000 calories. Various devices and logic are employed to persuade the boys to eat. The selection of individuals who will show clinical improvement on a gaining diet requires, first, attention to the causes of underweight and, secondly, recognition of the wide range in normal weights and understanding of the various types of body build. Individuals placed on a gaining diet who are definitely below their normal weight will show a prompt and favorable response."

[**Supplementary feeding in elementary schools**], B. WAIT ET AL. (*Massachusetts Sta. Bul. 305 (1934), pp. 42, 43*).—Brief progress reports are given on studies of the comparative value of milk and tomato juice and the value of evaporated milk for supplementary midmorning feeding of elementary school children.

Studies in the self-selection of diet by young children, C. M. DAVIS (*Jour. Amer. Dental Assoc., 21 (1934), No. 4, pp. 636–640*).—This is a general discussion of the results of the previously noted study (E.S.R., 60, p. 592), which was begun early in 1926 and terminated in 1931. During the entire period 15 children had taken part in the study for periods of from 6 mo. to 4.5 yr., and accurate records had been obtained on weighed and measured quantities of each food eaten in 37,500 meals.

"All the children were able to select from the list of simple natural foods a satisfying diet and maintained excellent appetites. They so regulated both the varieties of foods chosen and the quantities of them that these were well within their digestive capacity, as was shown by their freedom from constipation and digestive disturbances. Their nutrition, as far as can be judged by present standards, was of the best, and the roentgenograms of their bones show their diet to have been fully adequate for normal bone development."

Nutritive value of raw and heated casein with and without added amino acids, E. O. GREAVES and A. F. MORGAN (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 506, 507*).—In an attempt to determine the site of injury to the protein molecules of wheat gluten and casein on heating at a temperature of 150° C. for 30 min. (E.S.R., 65, p. 789), supplements of various amino acids were added to untreated casein and to casein heated uniformly at 140° in a thin layer for 30 min. The nutritive value of the materials was tested by growth experiments on young rats and by determinations of biological values according to the method of Mitchell (E.S.R., 51, p. 407).

The tryptophan and tyrosine supplements did not increase the growth-promoting value of either the raw or heated casein, cystine increased the growth-promoting effect of both raw and heated casein, and lysine and histidine increased the value of the heated but not of the raw casein. Similar results were obtained in the biological value determinations. The authors conclude that the lowering of the nutritive value of casein resulting from heating is due to a definite change in the lysine and histidine fraction of the protein.

Effects of cod-liver oil on basal metabolism and on the thyroid gland, T. C. SHERWOOD, L. A. TOTH, and K. CARR (*Endocrinology, 18 (1934), No. 2, pp. 254, 255, figs. 2*).—Cod-liver oil administered to rats in doses of from 1 to 5 cc per kilogram per day as a supplement to a well balanced grain ration with green food and milk produced marked depletion in the colloid contents of the acini of the thyroid glands. This did not occur in control groups receiving corn oil, viosterol, and cod-liver oil from which the vitamin A had been re-

moved by heat and oxidation. No changes from normal in the basal metabolism were produced in any of the animals.

Effect of feeding egg yolk on liver lipids of rats, R. OKEY, E. YOKELA, and G. KNOCK (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 507, 508*).—In this preliminary report evidence is presented that in young rats fed for 60 days on a diet containing 25.3 percent of dried egg yolk powder and furnishing 8.4 percent of egg yolk protein and 16 percent of egg yolk lipids, an accumulation of total cholesterol resulted in the liver. The cholesterol values for the experimental groups were for males 2.58 and females 3.86 percent, as compared with values of 0.48 and 0.3 percent for controls receiving alcohol-ether extracted egg yolk and Crisco in place of untreated egg yolk. These results are considered of possible significance in view of the fact that egg yolk is being used very liberally in diabetic diets at the present time. It is thought that the high incidence in diabetics of diseases associated with cholesterol deposition, such as gallstones and arteriosclerosis, may have some relation to this fact.

Mineral growth of the human fetus, V. IOB and W. W. SWANSON (*Amer. Jour. Diseases Children, 47 (1934), No. 2, pp. 302–306, fig. 1*).—Data are reported on the weight and the water, fat, and ash content of 17 human fetuses estimated to be from 2.6 to 10 mo. in age, and on the content of sodium, potassium, calcium, magnesium, phosphorus, chlorine, and nitrogen of the fetuses calculated in millimols (number of milligrams equivalent to atomic weight) per kilogram of body weight and in millimols per kilogram of dry fat-free substance.

The laxative effect of a regenerated cellulose in the diet: Its influence on mineral retention, H. MORGAN (*Jour. Amer. Med. Assoc., 102 (1934), No. 13, pp. 995–997*).—To determine the laxative effect and influence on mineral balance of a regenerated cellulose, balance experiments were conducted on 8 normal subjects, 5 male and 3 female, from 22 to 35 yr. of age. An adequate low roughage type of diet was given for a 5-day control period plus preliminary and collection periods to total 9 days in all. This was followed by a 5-day test period, also with preliminary and collection periods, on the same diet plus 20 g of a calcium-, nitrogen-, and phosphorus-free cellulose containing 90 percent of crude fiber. The cellulose was ground and sifted to the consistency of coarse white corn meal.

The cellulose proved definitely laxative, as evidenced by increased weight and moisture content of the feces and increased number of defecations. The balance experiments showed a tendency toward increased excretion of nitrogen and a definite increase in the excretion of phosphorus, calcium, and fecal total ash during the period of cellulose ingestion.

The author is of the opinion that "it is doubtful whether the laxative potency of the cellulose counterbalances its detrimental effect on mineral retention. The wisdom of giving a high roughage diet to children and subjects under conditions of marginal mineral intake is severely questioned. These data afford but slight basis for predicting possible injurious effects of cellulose products when they are eaten over a long period of time."

The excretion of iron in human urine under physiological and pathological conditions [trans. title], F. LANYAR, H. LIEB, and A. VERDINO (*Hoppe-Seyler's Ztschr. Physiol. Chem., 217 (1933), No. 3–4, pp. 160–166*).—Using the colorimetric method of Lintzel (E.S.R., 65, p. 690), the authors have determined the iron content of samples of human urine in health and disease and under different methods of iron administration, with the conclusion that only when iron is given parenterally can it be excreted through the kidneys.

Cyclic variations in urinary excretion of iodine in women, V. V. COLE and G. M. CURTIS (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 1, pp. 29, 30, fig. 1*).—*In this preliminary report data are presented on the urinary iodine* excretion throughout the entire menstrual cycle of four women from 18 to 32 yr. of age, of whom one had a nontoxic nodular goiter, another exophthalmic goiter, and the other two showed no evidence of thyroid disease. The subjects were allowed a general diet excluding foods known to be of high iodine content.

All of the subjects showed either a premenstrual or menstrual rise in iodine excretion, one of them during two consecutive periods. The variations in urinary iodine excretion did not parallel those reported in blood iodine by previous workers.

Studies on fluorine in the nutrition of the rat, I, II (*Amer. Jour. Physiol., 106 (1933), No. 2, pp. 350–355, fig. 1; 356–364*).—Two papers are presented.

I. *Its influence upon growth*, A. R. Lamb, P. H. Phillips, E. B. Hart, and G. Bohstedt.—The importance of the study of chronic fluorine poisoning is discussed, with a brief review of the literature, and feeding experiments on rats are reported in which the effect was tested of the incorporation in the basal diet of 0.043 percent sodium fluoride, 0.04 calcium fluoride, and 0.6, 1, and 2 percent of rock phosphate, respectively. Observations were made of the rate of growth and in most of the experiments of reproduction through the fifth generation.

The data obtained indicate that small doses of fluorine inhibit the normal growth of the rat. From the food intakes the upper limits of safety were estimated to be approximately 20 mg of fluorine per kilogram of body weight in the form of sodium fluoride and 40 mg per kilogram in the form of rock phosphate. The toxicity of fluorine in calcium fluoride was much less than that of the sodium salt and of similar magnitude to the fluorine as rock phosphate.

Growth records indicate that the effects of fluorine are felt most acutely during the suckling period. Typical effects of fluorine on the incisor teeth were produced even at the lowest levels.

II. *Its influence upon reproduction*, P. H. Phillips, A. R. Lamb, E. B. Hart, and G. Bohstedt.—In this phase of the investigation three series of experiments were conducted. The first followed the general plan of the study noted above in an attempt to determine if fluorine has a cumulative effect upon reproduction and growth from generation to generation. The second was designed to study the effect of fluorine as sodium fluoride and rock phosphate upon oestrum and certain endocrine glands, and the third to compare the effect of sodium fluoride and inanition upon the oestrous cycle.

From the evidence submitted the authors conclude that chronic fluorine poisoning does not inhibit reproduction or have a cumulative effect upon reproduction or other physiological processes. The oestrous cycle is not disturbed by levels of sodium fluoride compatible with normal growth, but if the dosage is increased beyond the threshold level of 25 g the resulting inanition causes suppression of oestrum. Lactation and rate of reproduction are likewise suppressed by fluorine when fed in amounts above the upper limits of safety. Coincident with this there is a reduced intake of food.

"Since no direct effect of fluorine has been demonstrated, the question arises as to its specific mode of action. The generalized systemic reaction to chronic fluorine poisoning suggests that the mechanism of fluorine toxicity may be that of an interference in some manner with cellular metabolism."

[Vitamin studies at the Iowa Station] (*Iowa Sta. Rpt. 1933, pp. 28, 50, 60, 116–119*).—Progress reports (E.S.R., 69, p. 148) are given on studies by

L. Yoder (p. 28) on the depression of intestinal reduction by vitamin D and by Yoder and B. H. Thomas (p. 28) on the nature of the floridin activation of cholesterol; by V. E. and P. M. Nelson and B. Lowe (pp. 59, 60) on the effect of hydrogenated lard, storage lard, and heated lard on the destruction of vitamin A in foods; by P. M. Nelson and P. P. Swanson (pp. 116–118) on the influence of experimental technic during the preliminary period in vitamin A determinations on the response of the test animal to supplementary feeding of the vitamin, and conditions influencing the production of uniform experimental animals in the stock colony; by Nelson, Swanson, and E. S. Haber (pp. 118, 119) on the effect of storage on the vitamin A content of canned tomatoes, and of varying known fertilizer treatments on the vitamin A content of sweetpotatoes of the Prolific variety; and by Swanson and Haber (p. 119) on the vitamin A content of green corn shoots.

The comparative vitamin A content of nut-margarines and butter, C. F. Poe and H. A. Fehlmann (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 559–564, figs. 5*).—Following the same method as in the previous study of colored margarines (E.S.R., 70, p. 279), the authors have determined the vitamin A content of a number of uncolored nut margarines purchased on the open market. The margarines were fed at five levels of from 0.1 to 1 g daily for periods of 8 weeks after the initial depletion period. The animals receiving the higher levels showed slight gains in weight during the first 2 or 3 weeks and then lost weight rapidly. The tabulated gains during the first 4 weeks showed wide differences for the various margarines, and marked differences were also found in the chemical composition of the various samples, the fat content of which ranged from 78.12 to 92.54 percent.

Unit values are given for one sample of unpasteurized and four of pasteurized butter fed in comparison with the nut margarines. The one sample of unpasteurized butter contained 33.3 units per gram and the samples of pasteurized butter 31.7, 40, 36, and 32.5 units per gram.

The authors conclude that nut margarines in comparison with butter are an extremely poor source of vitamin A, and that the variation in the fat content of the different samples examined indicates the desirability of establishing standards for nut margarine.

The composition and vitamin A value of some New Zealand fish-liver oils, F. A. Denz and F. B. Shorland (*New Zeal. Jour. Sci. and Technol., 15 (1934), No. 5, pp. 327–331, figs. 2*).—Data are reported on the vitamin A content (as determined colorimetrically), iodine number, and saponification value of the liver oils of the groper, bass, ling, English hake, and cod, and the body oil of the eel. The oils were obtained either by steaming or by extracting the cooked livers with petroleum ether.

The method of extraction proved to have little effect on the vitamin A content of the oil. The eel body oil had the lowest content of vitamin A, 4.2 blue units. Of the liver oils, the three samples of cod-liver oil had the lowest blue values, 7.5, 16, and 16 units, respectively. The ling and English hake gave large yields of oil with comparatively low blue values, ranging from 116 to 510 units. The values for the groper and bass compared favorably with halibut-liver oil. The highest value obtained was for bass-liver oil, 8,000 blue units.

A clinical method for determining moderate degrees of vitamin A deficiency, P. C. Jeans and Z. Zentmire (*Jour. Amer. Med. Assoc., 102 (1934), No. 12, pp. 892–895, fig. 1*).—The method described is based upon the fact that functional night blindness is a manifestation of vitamin A deficiency, and that tests which make it possible to detect mild degrees of night blindness and recovery therefrom indicate moderate degrees of vitamin A deficiency

and the effectiveness of treatment. The test consists essentially in measuring photometrically the sensitivity of the subject to light following partial dark adaptation. The instrument used in making the test is described and illustrated schematically, the technic of the test is outlined, and data obtained in its use are presented and discussed.

Of 233 children examined, 20 were excluded because of gross defects in vision or inability to cooperate in the test. Of the 213 children remaining, 168 were considered to have normal and 45 poor recovery. Of those showing poor recovery, 21 were retained in the hospital and given 3 teaspoonfuls of cod-liver oil daily in addition to the hospital diet, and tested at frequent intervals. Recovery was considered to have occurred when two successive examinations on different half days gave normal readings. As measured by this criterion, all of the subjects recovered, the period required varying from 4 days to 6 weeks, with an average of about 12 days.

The author believes that the test is satisfactory for detecting moderate degrees of vitamin A deficiency and also adequate available A for generation of visual purple, but that there is no evidence to indicate whether or not this amount of vitamin A is sufficient for optimal nutrition.

Influence of dietary factors upon the resistance of the white rat to experimental tuberculosis.—I, Vitamin A deficiency, P. M. Otero, E. Koppisch, and J. H. Axtmayer (*Puerto Rico Jour. Pub. Health and Trop. Med., 9 (1934), No. 3, pp. 314–320*).—In this study of the extent to which vitamin A contributes to the maintenance of high resistance of albino rats to warm-blooded strains of tubercle bacilli, groups of rats suffering from complete or partial deficiency of vitamin A were given human, bovine, and avian tubercle bacilli by feeding or by intraperitoneal injection and continued on the deficient diets until death, or for 49 days if the animals survived.

"All rats inoculated with human and bovine organisms failed to develop tuberculosis irrespective of the diet on which they were kept and of the method of inoculation. Fifty percent of all rats (even when on normal diet) which were inoculated with the avian strain showed tuberculosis of the peritoneum and abdominal lymph glands at autopsy. The evolution of the avian tuberculous process seemed to be accelerated in the totally depleted rats as compared with those maintained on a partially deficient or adequate diet. Furthermore, caseation was noted only in animals totally depleted of vitamin A."

The influence of washing and steaming on the vitamin B_1 content of rice milled in different ways [trans. title], A. G. van Veen (*Meded. Dienst Volksgezondh. Nederland. Indië, 22 (1933), No. 3, pp. 181–189*).—Using ricebirds (bondols) in place of pigeons, the author has determined the vitamin B_1 content in terms of international units of unpolished, slightly polished, and highly polished rice in the original state and after washing, washing and steaming, soaking and steaming, soaking, washing and steaming, prolonged boiling, and prolonged washing.

The original samples had vitamin B_1 values of from 400 to 500 international units per 500 g for the unpolished, 250 to 400 for the slightly polished, and 100 to 200 for the highly polished rice. After washing, the corresponding values were 250–300, 125–200, and less than 100. Little or no destruction took place in the two samples of polished rice on steaming or on prolonged cooking, but prolonged washing reduced the values to much less than 100 units.

Attention is called to the report by Aykroyd (E.S.R., 69, p. 469) on the high vitamin B_1 content of polished parboiled rice, with the comment that the results have been verified and that, moreover, the parboiled rice has a better flavor than ordinary unpolished rice.

Vitamin B complex and gastric secretion, D. R. Webster and J. C. Armour (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 463, 464*).—In continuation of the study noted previously (E.S.R., 70, p. 134), two experiments on a dog operated on in a similar way are reported in one of which dried, and in the other autoclaved brewery yeast was used to restore the secretion of gastric juice when stimulated by histamine. In both cases there was a marked response, although with the autoclaved yeast the time required was very much longer than with the dried yeast. The results are deemed suggestive but not conclusive in indicating that vitamin B_1 is the constituent of yeast which is effective in restoring the normal reaction of the gastric mucosa to nervous and chemical stimuli. Vitamins A, D, and C are thought not to be essential for the proper functioning of the gastric glands.

The staining of vitamin C in the adrenal glands, G. Bourne (*Aust. Jour. Expt. Biol. and Med. Sci., 11 (1933), No. 4, pp. 261–267, figs. 3*).—Essentially noted from another source (E.S.R., 69, p. 903).

The vitamin D content of eggs, H. D. Branion (*Canad. Pub. Health Jour., 25 (1934), No. 4, pp. 171–174*).—This paper includes a brief survey of the literature, a summary of studies by the author on the vitamin D content of eggs produced by hens receiving various vitamin D supplements, and a discussion of the extent to which eggs can supply the vitamin D requirements of children. The average egg yolk of hens receiving the customary feed of a commercial poultry flock, with the exception of vitamin D, contained about 4 Steenbock units and of hens receiving 2 percent of cod-liver oil in addition to the same ration 30 units. Egg yolk from hens receiving 2 percent of 1 D preparation of viosterol contained 30 and from hens receiving 2 percent of 10 D cod-liver oil (fortified with viosterol) 60 units. From the dosage of cod-liver oil usually recommended for infants, 3 teaspoonfuls daily, it is estimated that the requirement of vitamin D for infants is about 140 Steenbock units and for children over 2 yr. of age about 50 units. A case of fairly severe rickets in a negro child was cured by the daily addition to the diet of one egg from hens receiving 2 percent viosterol.

"It would seem feasible to supply eggs for hospital and infant feeding use the vitamin content of which could be fairly definitely assured by supervision of the diet and management of the laying flock."

Necessary versus optimal intake of vitamin G (B_2), H. C. Sherman and L. N. Ellis (*Jour. Biol. Chem., 104 (1934), No. 1, pp. 91–97*).—In the investigation reported, skim milk powder was fed to rats at four different levels of intake as the sole source of vitamin G in a diet adjusted to furnish all other known dietary essentials in the same proportions in each of the diets. Two series of experiments were run. The first consisted of a direct comparison of three diets fed to evenly-matched rats 28 days old at the beginning of the experiment. These diets furnished 0.9, 1.3, and 2.2 Bourquin-Sherman units of vitamin G per gram of air-dry food mixture. In the second series vitamin G was fed at two levels, 0.4 and 0.9 unit per gram of the air-dry food, respectively. The caging of the animals was the same except that the screens in the cages of the second group were of larger mesh and raised farther above the trays receiving the feces, as an additional precaution to prevent coprophagy. The observations included (1) gains in weight during the twenty-eighth to fifty-sixth day of life of the original rats and many of their offspring, (2) the breeding records, (3) the average weights of the young at 28 days, and (4) the gains in weight of the 28-day-old rats after transferring to a vitamin G-free diet.

On the diet furnishing the lowest level of vitamin G, 0.4 mg per gram of air-dry food, growth was below the average growth of the authors' colony on

a completely satisfactory diet. On 0.9 mg the growth approximated this average, and on each of the larger amounts growth was increased slightly but significantly. The females on the diets furnishing increasing amounts of vitamin G bore young at increasingly earlier ages, and showed increased vitality in their adult lives as indicated "by an extension of the period between the attainment of maturity and the onset of senility, by greater success in the production and rearing of young, and by the further fact that the young of these animals were superior to the cousins born of parallel animals whose food was less rich in vitamin G."

The weights of the young at 28 days increased with increasing content of vitamin G, and the animals in the successive groups were able to grow for increasing lengths of time on diets low in vitamin G. "Those findings make clear that the optimal intake of vitamin G is much above the amount which is easily demonstrable as strictly necessary. It is probable that the true optimum is higher than the highest level here fed."

Effect of heat on vitamin G potency of disiccated yeast, F. C. BING and D. G. REMP (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, pp. 624–626, fig. 1*).—Studies on the effect of heat upon both the growth-promoting and the dermatitis-preventing action of dried yeast (using mice as experimental animals) are reported. The results indicated that heating previously desiccated yeast at 105° C. for 2 weeks had no appreciable effect on either of these properties, but that heating at 150° brought about a gradual loss in activity, which was complete at the end of 2 weeks as regards both properties.

Mutilated growth, T. W. TODD (*Jour. Amer. Dental Assoc., 21 (1934), No. 3, pp. 479–488*).—In this lecture the term mutilated growth is used to indicate developmental growth interrupted by disease or debility. With illustrations from the clinical experience of the author and his associates, it is shown that "the particular expression of developmental growth is inhibited which is characteristic of the period when the disorder happens to strike. During and after convalescence, one of two courses must be taken. Either the development growth previously inhibited must renew its activity with increased velocity, or adjustments must be made in the now mutilated pattern of development growth." As a concrete example the clinical history is presented of the course of facial development in an infant suffering from a growth handicap through chronic intestinal disorder.

"Children of this type characteristically start with infantile gastrointestinal debility and progress to facial maldevelopment in very early childhood. Owing to restricted growth of the nasopharynx, they come to the ear, nose, and throat specialist for removal of adenoids to clear the narrowed passages, then to the orthodontist for spacing of crowded teeth in underdeveloped jaws, and they finally threaten the child guidance clinic because of behavior difficulties. The problem of nutrition becomes first a medical, then successively a surgical, a dental, a psychologic, and perhaps ultimately a social problem. Diet and nutrition are our first defense against the debility which precedes defect."

Effect of radiant energy with and without iron upon nutritional anemia in the rat, H. H. BEARD, A. G. JOHNSON, and E. J. ANDES (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 1, pp. 23–26*).—In this preliminary report, data are summarized from preventive and curative experiments on milk-fed rats indicating that irradiation of the animals or of the milk increases the beneficial effects of iron in hemoglobin formation and regeneration. The effect was attributed to the formation of vitamin D, and as a test of this point two anemic rats were given 0.3 mg of iron daily with the addition of 1 drop of a potent vitamin D preparation which was added to the milk. A prompt regeneration of hemoglobin and red blood cells occurred.

Metabolism of iron and copper in anemia rats, F. C. Bing, E. M. Saurwein, and V. C. Myers (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, pp. 619, 620*).—Four groups of 5 or 6 rats made anemic by exclusive milk feeding were treated as follows:

One group was sacrificed, and the carcasses minus stomachs and intestines were analyzed for iron and copper. A second group received daily supplements of 0.5 mg of iron as $FeCl_3$ by mouth, a third group the same quantity of iron by intraperitoneal injection, and a fourth group 0.5 mg of iron and 0.025 mg of copper as $CuSO_4$ by mouth. Hemoglobin determinations were made at intervals for 17 days, after which the animals were killed and their carcasses analyzed for iron and copper. During the period of treatment the average hemoglobin values of the group receiving iron by mouth rose from 4.15 to 7.23 g per 100 cc of blood, by intraperitoneal injection from 4.03 to 12.92, and by mouth with copper supplements from 3.9 to 13.4 g per 100 cc.

The average iron and copper values for the carcasses of the different groups were as follows: Controls, iron 1.13 and copper 0.051 mg; iron orally, 2.12 and 0.061 mg; iron injected, 6.78 and 0.104 mg; and iron and copper orally, 3.63 and 0.115 mg, respectively.

The data suggest that intraperitoneal injections of iron are as effective in hemoglobin regeneration as the oral administration of both iron and copper. It has been calculated that the average retention of copper in rats receiving iron injections was 73 percent of the total intake in the form of the copper of the milk (which contained an average of 0.14 mg of copper per liter), while in the group receiving iron orally it was 17 percent and in the group receiving both iron and copper 12 percent of the total intake of copper during the experimental period.

Metallic glutamates in nutritional anemia, E. Brand and C. J. Stucky (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, pp. 627–630*).—Tabulated data are presented on the response in hemoglobin regeneration of anemic rats to various combinations of iron, copper, magnesium, and manganese, with and without glutamic acid. It is concluded that glutamic acid has no supplementary effect for iron. In all cases where iron supplements only were fed there was a slow regeneration of hemoglobin, although much less than with iron and copper.

Glutamic acid in milk anemia.—Effect on hemoglobin regeneration in "cystine deficient" animals, E. Brand and C. J. Stucky (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 6, pp. 689–692*).—"Rats bred from mothers subsisting on a low protein (cystine-deficient) ration recovered from their 'milk anemia' and showed good growth when glutamic acid (70 mg) was added to their iron supplement, whereas those from which glutamic acid was withheld but the iron added died."

In explanation of these findings it is suggested that differences in the animals themselves may be an important consideration in interpreting the discrepancies in the findings of various laboratories in anemia studies. "Secondary anemias and particularly milk anemia in the rat may frequently appear to be only mineral deficiencies, but, under conditions, this simple picture may be complicated by other maladjustments which in turn will determine aspects of hematopoiesis and of therapy."

Cobalt glutamate in nutritional anemia, E. Brand and C. J. Stucky (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 6, pp. 739–742, figs. 2*).—In preliminary experiments it was found that rats which had recovered from anemia on supplementing milk with copper and iron showed renewed hematopoietic activity on supplementing the diet further by 0.5 mg of cobalt as cobalt nitrate per rat per day. In further experiments in which this quantity of cobalt in the form

of glutamate and nitrate, respectively, were given as supplements to iron (0.5 mg) as ferrous glutamate and copper (0.1 mg) as copper glutamate, more rapid regeneration of hemoglobin and erythrocytes occurred than in the controls not receiving the cobalt salts and with higher than normal final levels. In both cobalt groups there was a gradual increase in the values of the blood constituents after the cobalt had been withdrawn and in a few instances even before the removal of the cobalt. The animals receiving cobalt glutamate grew as well as the controls, but the growth of the cobalt nitrate group was retarded.

Rôle of decreased amount of gastric secretion on production of pernicious anemia, R. ISAACS and S. M. GOLDHAMER (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 6, pp. 706, 707, fig. 1*).—Data are presented showing that if pernicious anemia gastric juice in quantities similar to that secreted by a normal person is administered after incubation with muscle tissue (beefsteak) to pernicious anema patients hematopoietic activity develops. This is thought to indicate that a deficiency in the quantity as well as the quality of gastric juice is significant in pernicious anemia.

The production in dogs of chronic black tongue with anemia, C. P. RHOADS and D. K. MILLER (*Jour. Expt. Med., 58 (1933), No. 5, pp. 585–605, pls. 3, figs. 6*).—In this complete report of an investigation noted previously from a preliminary report (E.S.R., 69, p. 470), protocols are given of six of the experimental dogs suffering from chronic blacktongue, and the general symptoms, including stomatitis, glossitis, and manifestations of a disordered function of the gastro-intestinal tract, are described, as well as the blood findings.

It is considered of significance that no improvement in symptoms and blood values followed the parenteral administration of large doses of liver extract. "That this material is specific in relieving the symptoms of sprue and pernicious anemia has been conclusively shown. Since the oral administration of substances rich in vitamin B_2 (G) did produce improvement in blood values, it would appear that the dog utilizes vitamin B as such in hematopoiesis and not as an intermediate product of gastric digestion as does the human being."

The paper is illustrated by paintings, prints, and photographs of the tongues of dogs suffering from chronic blacktongue.

Creatinuria among adolescent males, A. B. LIGHT and C. R. WARREN (*Jour. Biol. Chem., 104 (1934), No. 1, pp. 121–128*).—This study was conducted at a private school for boys in New Jersey. The data reported include a summary by age groups of the analyses for creatine of single 24-hr. specimens of urine of 81 boys, individual values for preformed creatinine, creatine, and preformed and total coefficients of creatine of 34 boys, and creatine values obtained under special conditions.

With increasing age, from 14 to 19 yr., the percentages of the numbers excreting creatine and the absolute quantities of creatine excreted decreased. Of the 12 subjects 14–15 yr. of age, 6 excreted creatine, with an average of 117 mg per 24 hr., while of the 6 subjects 18–19 yr. of age only 1 excreted creatine and to the extent of only 17 mg per day. The values for the 34 subjects excreting creatine showed considerable variation in creatine for boys of the same age, but decreasing values with increasing age. The preformed creatinine values remained remarkably constant for the different age groups.

Five subjects showing creatine in single 24-hr. urine specimens were kept in bed for almost an entire 24-hr. period during which the three meals consumed were of high protein content. The following day the subjects attended classes and took part in the regular exercises and consumed a diet of normal protein content. Urine analyses for the entire period showed practically negligible creatine excretion during the period of bed rest as compared with th

following day. Five subjects confined in bed on account of illness showed very low creatine excretion during the period of enforced rest, a considerable increase on the first day of limited exercise, and a very marked increase on the first day of unlimited exercise, followed by a gradual decrease. One subject admitted to the infirmary with the complaint of feeling very tired but with no evidence of infection showed a high creatine excretion.

In discussing these findings the authors emphasize the wide fluctuations in creatine excretion in adolescent boys and call attention to the frequency of a certain lethargy and aversion to physical exercise among the subjects still excreting creatine. The relationship between creatinuria and muscular activity is commented on as follows:

"The marked increase in creatine excretion encountered on the first day of muscular activity following a period of confinement to bed, due to an illness or injury, and its progressive decrease on each succeeding day, points to the fitness of skeletal muscles to meet the demands of exercise as an additional factor in the phenomenon of creatinuria among adolescent males."

Creatinuria and physical fitness (*Jour. Amer. Med. Assoc., 102 (1934), No. 17, pp. 1401, 1402*).—*An editorial comment on the report noted above.*

Creatine metabolism in children with hypothyroidism, H. G. Poncher, M. B. Visscher, and H. Woodward (*Jour. Amer. Med. Assoc., 102 (1934), No. 14, pp. 1132–1135, figs. 2*).—The clinical significance of diminished thyroid activity and creatine metabolism during the period of childhood is discussed on the basis of detailed observations on two cases of hypothyroidism in children 5 and 12 yr. of age from whom 24-hour urine specimens were obtained for 53 and 36 consecutive days, respectively.

The subjects showed an absence of the physiologic creatinuria of childhood when not receiving thyroid therapy or creatine by mouth. The absence of creatine could not be attributed to a low protein intake, as the diet was not creatine-free and contained adequate amounts of protein. Creatine appeared in the urine within 24 hr. after thyroid was administered and continued as long as the extract was given, with temporary increases following increases in dosage. The thyroid therapy had no appreciable effect on preformed creatinine excretion. The total creatinine coefficient of the younger subject averaged 21.2 before and 29 after thyroid treatment. Corresponding values for the older subject were 15.4 and 24.6, respectively. When creatine was ingested in 3-g daily doses, the younger subject excreted only 45 percent of the ingested creatine and showed no increase in creatinine excretion. The older subject excreted only 19 percent of the ingested creatine, but showed a definite rise in creatinine excretion.

"From these observations it seems apparent that measurement of the urinary creatine is a delicate index of the effect of thyroid administration. In view of the greater ease, simplicity, and reliability of creatine analysis than of the basal metabolic rate in children, it seems that this measurement may serve as a useful clinical aid in controlling thyroid medication."

Relation of diet to dental caries, H. F. Hawkins (*Jour. Amer. Dental Assoc., 21 (1934), No. 4, pp. 630–635*).—Arguments are presented in support of the hypothesis that dental decay is caused by the acids produced by ferments, starches, and possibly sugars and prevented by the buffer value of the saliva, which is dependent upon its content of soluble alkaline salts and calcium. Dietary measures to control acid-base and calcium-phosphorus balances are summarized.

Experimental production of hypercalcemia in human beings by means of irradiated ergosterol, T. D. Spies and R. F. Hanzal (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 6, pp. 747–750, fig. 1*).—Four hopelessly diseased

young adult patients, 3 suffering from widespread miliary tuberculosis and 1 metastatic carcinoma, were given massive doses of irradiated ergosterol, sodium acid phosphate, and calcium lactate during the last 9, 16, 16, and 25 days of life, with frequent blood calcium and phosphorus determinations. After death complete autopsies were made for the purpose of detecting calcification of the tissues. Although the blood calcium and phosphorus rose as high as 16.6 mg per 100 cc, no detectable symptoms of hypercalcemia were produced and post-mortem examination showed no evidence of calcium deposits.

Attention is called to the current practice of injecting calcium salts intravenously for many conditions such as abdominal pain, lead poisoning, etc., and the opinion is expressed that the oral administration of large doses of irradiated ergosterol may be safer and more efficacious.

Phosphorus partition in blood and serum, serum calcium, and plasma phosphatase during healing of late rickets, G. STEARNS and E. WARWEG (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, p. 416*).—It is noted briefly that during the slow healing of late rickets of the low phosphorus type in two patients evidence was obtained that the organic acid-soluble (ester) phosphorus of the corpuscles, which is very low in active late rickets, responds very quickly when antirachitic treatment is given and may rise to normal values before any definite change takes place in the serum organic phosphorus. In one patient the intake of vitamin D proved insufficient to maintain the increased level, and after the value had fallen much larger quantities of vitamin D and a much longer time were required to bring the ester phosphorus back to normal.

The plasma phosphatase values of both patients were five or six times the normal at the beginning of healing and, although decreasing somewhat during healing, remained high after healing was complete, as determined by X-ray examination.

Pathologic changes in the organs of scorbutic guinea pigs, O. A. BESSEY, M. L. MENTEN, and C. G. KING (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 455–460*).—Pathological changes, as observed on microscopic examination, in the adrenals, heart, testes, and liver of scorbutic guinea pigs are described in considerable detail.

The most characteristic lesion found was the depletion of fat and cholesterol from the adrenal cortex as observed in Sudan-stained and formalin-fixed tissues. The cortex of the adrenals of normal animals was heavily laden with fat-staining material. This was maintained in guinea pigs deprived of vitamin C until several days before death, when the fat began to disappear from the outer two-thirds of the fasciculata. When scurvy developed rapidly the depletion of fat was irregular, with intervening fat-stained areas always in association with hemorrhagic foci. Cholesterol disappeared from the cortex at the same time as the fat.

The staining of sections of the adrenals with silver nitrate followed about the same course as the alterations in fat and cholesterol, suggesting that the reducing property of the adrenal cortex is associated with the presence of both vitamin C and lipids.

Fatty degeneration of the myocardium, fatty infiltration of the liver, and extreme degenerative changes in the testes, with death of the germinal epithelium and spermatozoa, were also observed in severe scurvy. Occasionally the connective tissues of animals dying from scurvy showed a swollen edematous appearance, notably in the arterioles of the lungs. "While it is impossible to exclude such contributory factors as may be supplied by spontaneous infections in the development of these vascular changes, we feel such changes are to be

interpreted primarily as alterations in the colloidal state of the collagen due to lack of vitamin C as postulated by Wolbach and Howe [E.S.R., 55, p. 388]."

TEXTILES AND CLOTHING

The effect of humidity upon the diameter of wool fibers, J. A. Gorman (*Natl. Wool Grower, 24 (1934), No. 6, pp. 22, 23*).—A group of 60 Lincoln fibers and 10 fibers from wool top of 50's quality was measured with the microscope at room temperature and humidity at the Wyoming Experiment Station. The fibers were soaked in water for 24 hr. and again measured. The Lincoln fibers showed an average increase in diameter of 3.6 percent, and the 10 fibers increased 11.6 percent.

In order to check the micrometer caliper measurements against the microscope measurements, 108 Lincoln wool fibers and 10 Polwarth wool fibers were measured by each method. Microscope measurements were made at the end of the fiber and the caliper measurements about 1 in. from the end of the fiber. After soaking for 24 hr., it was found that the 108 fibers increased 5.3 percent in diameter when measured by the microscope and decreased 3.8 percent when measured by the micrometer caliper. The Polwarth fibers increased 11.8 percent in diameter when measured by the microscope and decreased 2.4 percent when measured by the micrometer caliper. The probable reasons for these variations are discussed.

Measurements of 25 fibers from each grade of wool top before and after soaking in water for 24 hr. showed an increase in diameter of from 3.8 to 9.6 percent when measured with the microscope and from 3.2 to 7.2 percent when measured with the micrometer calipers. The changes did not seem to be correlated with any particular grade of wool. Fibers soaked in water and measured at 12-hr. intervals gradually increased in diameter, reaching the maximum diameter at 36 hr. It was concluded that temperature and humidity should have little, if any, influence on the diameter of wool fibers when measured in the laboratory, where the change in these environmental conditions was usually small.

The deterioration of weighted silk under the conditions of acidity, alkalinity, and salinity to which fabrics are subjected in service and maintenance, R. Edgar (*Iowa Sta. Rpt. 1933, pp. 121, 122*).—Progress results are reported.

Wear of carpets, H. F. Schiefer and R. S. Cleveland (*[U.S.] Bur. Standards Jour. Res., 12 (1934), No. 2, pp. 155–166, figs. 12*).—This contribution describes briefly, with photographs, a carpet wear testing machine and gage for measuring thickness of carpet, and reports the results obtained in a study of the effect of various factors on wear in different carpet materials with and without "underlays", or material placed underneath the carpet to reduce slipping and to increase softness and durability.

The number of thousands of revolutions of the turntable on which the material is fastened required to wear the pile down to one-fourth of the original thickness measured by the special gage was taken as the wear index of the carpet. "The density of the pile appears to be the predominant factor of a carpet which affects wear. The height of pile is a factor of lesser importance. The quality of pile wool has a measurable effect. The types of pile anchorage studied have no appreciable effect. In general, the wear index is approximately proportional to the product of pile density squared and pile height.

"All underlays increased the durability of the carpets. The increase in wear index depends upon the underlay and the carpet. The composition, thickness, density, and compressibility of underlays are factors which contribute to

their effectiveness. An underlay appears to be more effective when it is used with carpets of short pile than when it is used with carpets of long pile."

HOME MANAGEMENT AND EQUIPMENT

Electrical cookery, M. M. Monroe, P. S. Greene, and L. Smith (*Maine Sta. Bul. 369 (1933), pp. 557, 558*).—This is a brief progress report (E.S.R., 68, p. 571) on the economical use of electricity for cooking, including the relation of the physical qualities of utensils to their efficiency, means of reducing the cost of oven operation for certain processes, and the baking performances of inexpensive noninsulated low wattage ovens.

MISCELLANEOUS

The United States Department of Agriculture: Its structure and functions, M. S. Eisenhower and A. P. Chew (*U.S. Dept. Agr., Misc. Pub. 88, rev. (1934), pp. IV+177, figs. 23*).—This is a revision as of December 15, 1933 (E.S.R., 64, p. 97).

A pasture handbook, A. T. Semple, H. N. Vinall, C. R. Enlow, and T. E. Woodward (*U.S. Dept. Agr., Misc. Pub. 194 (1934), pp. 89, figs. 27*).—Two articles noted respectively on pages 464 and 519 follow a foreword contributed by H. A. Wallace, Secretary of Agriculture.

Summary of research, 1887–1933: Forty-fifth Annual Report [of Arkansas Station], C. O. Brannen (*Arkansas Sta. Bul. 297 (1934), pp. 126, figs. 7*).—This is "a brief summary of the more outstanding practical results obtained from experimentation and study since the beginning of the station." The various lines of activity are for the most part noted elsewhere in this issue.

Report on agricultural research [of the Iowa Station] for the year ending June 30, 1933, R. M. Hughes et al. (*Iowa Sta. Rpt. 1933, pp. 159, figs. 20*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Report of the [Louisiana] Agricultural Experiment Station for the years 1931–1933, C. T. Dowell (*Louisiana Sta. [Bien.] Rpt. 1932–33, pp 31*).—The more important results of the station work during the past 6 or 7 years are brought together, as noted in further detail elsewhere in this issue.

Summary report of progress [of Maine Station] for the fiscal year ending June 30, 1933, F. Griffee (*Maine Sta. Bul. 369 (1933), p. 503–596, figs. 22.*)—This bulletin contains data noted for the most part elsewhere in this issue or previously, together with meteorological investigations (pp. 593, 594).

Annual Report of the Massachusetts Agricultural Experiment Station, 1933, F. J. Sievers et al. (*Massachusetts Sta. Bul. 305 (1934), pp. 67*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Annual Report of [Nevada Station], 1933, [S. B. Doten] (*Nevada Sta. Rpt. 1933, pp. 42, figs. 8*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Agricultural research in New Hampshire: Annual report of the director of the New Hampshire Agricultural Experiment Station for the year 1933, J. C. Kendall (*New Hampshire Sta. Bul. 280 (1934), pp. 31*).—The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

NOTES

Kansas College and Station.—On the evening of August 8, Dennison Hall was burned with a complete loss of the building and its equipment. The instruction departments of chemistry and physics and the chemical work of the station were housed in the building, but most of the station records were preserved.

Minnesota Station.—A new spring wheat has been named for the late Dr. R. W. Thatcher, formerly dean of the College of Agriculture and director of the station (E.S.R., 70, p. 289). Five years' milling and baking tests of this wheat indicate that it is the equal of Marquis in quality and has replaced Marquillo on the list of recommended varieties because of its superiority in disease resistance, yielding ability, and other desirable agronomic characteristics.

Missouri Station.—*The agricultural engineering department has devised a* new type of terracing machine, which is being considered for official use in the erosion control projects recently instituted throughout the grain belt under the joint supervision of the U.S. Departments of Agriculture and the Interior. In field tests at the Federal erosion control demonstration area at Bethany, in which the machine was drawn by a 15–30 kerosene burning tractor, it built standard broad base terraces at an average rate of 100 ft. of terrace in 10 min. 50 sec. The average cost per 100 ft. of completed terrace, 19 ft. wide at base, with 10-ft. water channel and crest of bridge 26 in. high, was 25 ct., this covering the cost of operating the tractor and the wages of the driver.

Nebraska Station.—W. P. Snyder, superintendent of the North Platte Substation since its establishment in 1904, died July 20 at the age of 59 yr. He was a native of Butler County, Pa., graduated from the Nebraska University in *1901 and received the M.S. degree from the Michigan College in 1903. He had* also served as assistant animal husbandman in the university from 1903 to 1904 and as assistant superintendent of farmers' institutes from 1904 to 1906.

L. L. Zook has been appointed acting superintendent of the substation.

New York State Station.—The Governor has approved two bills providing special appropriations for the station, one carrying $5,000 for studies on hop production and the other $3,500 for investigations of the corn ear worm on Long Island.

North Carolina College.—Dr. Eugene C. Brooks, president of the college and vice president of the Greater University of North Carolina, has resigned to become president emeritus.

Washington College and Station.—E. V. Ellington, head of the department of dairy husbandry, has been appointed vice dean of the College of Agriculture and assistant director of the station, effective June 1. Ben H. Pubols, chief of the examining unit of the contract records section of the U.S.D.A. *Agricultural Adjustment Administration*, has been appointed associate professor and acting head in the department of farm management and agricultural economics of the college and associate agricultural economist in the station. Dr. Victor Heiman has been appointed instructor in poultry husbandry in the college and assistant in poultry husbandry in the station, effective July 1.

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EDITORIAL

RESEARCH AND READJUSTMENT IN AGRICULTURE

In a recent terse and timely article in *Science*, Hon. Henry A. Wallace, Secretary of Agriculture, discusses the supposed conflict between agricultural science and the need to adjust agricultural production. "Agricultural science," he states, "enables farmers to increase crop yields per acre and increase the output of meat and milk per unit of feed consumed. As the users of agricultural improvements increase in number, output increases until prices fall. How can all this be reconciled," he asks, "with the need to make supply and demand balance?"

Despite the frequency with which this question has been raised, it represents no unperceived anomaly, and the answer is not hard to find. As Secretary Wallace goes on to say, were farmers to abandon science or even to use it with greatly decreased efficiency, "they would have to continue plowing, sowing, and reaping. But they would use poor machinery, poor technic, and poor seed. They would allow pests and diseases to ravage their crops and would harvest inefficiently what remained. By so doing, they would certainly reduce the output. But they would do so at a cost ruinous to themselves. They would increase their unit costs of production out of all proportion to any conceivable gain in prices."

Director Gray of the Arkansas Experiment Station has well pointed out in his latest annual report that "the criticism that the farmer is already too efficient, stated at times in the attempt to explain a condition of overproduction, expresses a complete misunderstanding of the farm problem. The inference in such a statement is that the farmer should take a round-about course in accomplishing what he sets out to do, that he should use poor rather than good practices." Actually, as he proceeds to show, "the only basis of competition for Arkansas farmers under any condition is the use of the best practices known. . . . Efficiency, which is the purpose of all good practices, can be neglected only at the expense of a low standard of living or failure."

"From their beginnings," as Secretary Wallace declares, "the U.S. Department of Agriculture, the State experiment stations, and State extension services have promoted efficiency on the farm. Efficiency

in the old sense of the word, however, is not enough. As farmers well know, profits cannot be got just by improving plants and livestock, by fighting diseases and pests, or by reducing the wastes of marketing. Ordinary technical efficiency reduces only the cost of production. Low-cost production may mean loss to the farmer if it is excessive production. Under present conditions it is necessary also to adjust the output to a changed world market."

Much the same thought has also been expressed in the report for 1933 by Director Burgess of the Arizona Experiment Station. "There are many things," he states, "which the farmer can do for himself, but there are equally as many things which he cannot do. He must use the results of scientific experimentation more and more *if he is to continue to maintain his high standards of living and* at the same time successfully compete with the low-priced labor of other countries when marketing his surpluses."

In the opinion of Secretary Wallace, "agriculture needs not less science in its production but more science in its economic life. . . . By emphasizing economic and technical problems equally, and by indicating their interdependence, the Department advances upon a *logical path, in which its various activities are wholly consistent* one with another.

"We might just as well command the sun to stand still as to say that science should take a holiday. Science has turned scarcity into plenty. Merely because it has served us well is no reason why we should charge science with the responsibility for our failure to apportion production to need and to distribute the fruits of plenty *equitably. That failure we must charge squarely to organized* society and to government. We need economic machinery corresponding to our scientific machinery in precision, in power, and in delicacy of adjustment. Science has done the first job and done it magnificently. It has shown us how to produce. Now it must show us how to distribute what we produce. It must go forward and not back. To production science we must add economic science, without for a moment ceasing to advance the former."

It is interesting to note that a discussion along somewhat similar lines has also been going on in England, where under the Marketing Act of 1933 the State is empowered to control the amount of farm production. As *Nature* puts it, the farmer there "may be ordered to withhold that which he seeks to sell; he may be prohibited from increasing his output of that which is profitable to him, in the interests of other farmers less favorably placed or less efficient; he may be forbidden to embark upon new lines of production." An editorial in that journal raises the question whether the new prosperity which planning along these lines is expected to bring may not tend toward a loss of efficiency disastrous to producers and con-

sumers alike and result in "organized stagnation." The editorial points out that it is here that science has its part to play, and it maintains that the vigorous prosecution of the research for which provision is specifically made in the Marketing Acts is "essential if the whole scheme is not to be found wanting. The leakages, waste and losses arising from faulty organization, uneconomic utilization of labor and machinery, the ravages of animal and plant diseases, the uninstructed use of fertilizers and feeding stuffs call for continuous investigation and correction, while an immense amount of new work is still awaiting organization and endowment in order to raise the quality of the food products presented to the public, and to devise better and cheaper methods of transport, processing, storage, and distribution."

It is significant that the various writers here quoted, as well as many others, unite in insisting that research along production lines is still vital. Director Gray in particular covers this point by declaring that while it may seem that the best cultural methods would finally be determined and further need for the study of this phase of agriculture would be negligible, changes occur "which make necessary a complete change of practices. Before the boll weevil invasion, late planting of cotton, except as affected by temperature and rainfall, made but little difference in yield, and the plants might be placed much wider in the row than at present. Not many years ago orchard crops could be handled successfully with but little care. Now, with the spread of diseases and insects, affecting both tree and fruit, successful practice requires numerous sprays and other means of control. Invention has given new and improved farm implements and for some farmers mechanical power, most of which are to save labor. Entirely new methods of preparing the land, planting, and cultivating may become necessary, and both the effectiveness and costs of such changes must be determined."

Thought might also well be given, it would seem, to the urgent need for research agencies which would be likely to develop speedily if through vicissitudes of nature or other unforeseen circumstances an expected overproduction were to shrink to a shortage of supply. Because of the specialized nature of their work, research organizations are particularly difficult of improvisation. The maintenance of continuity of policy and program is, therefore, a prime requisite in their sustained efficiency and availability.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Buffer intensities of milk and milk constituents, I, II, E. O. WHITTIER (*Jour. Biol. Chem., 83 (1929), No. 1, pp. 79–88, figs. 4; 102 (1933), No. 2, pp. 733–747, figs. 3*).—In the first two papers of this serial contribution from the U.S.D.A. Bureau of Dairy Industry, the author reports his observations on the relative effects of two of the principal buffering components of milk.

I. *The buffer action of casein in milk.*—The experiments recorded indicate that from milk titration data a characteristic curve may be obtained by plotting buffer intensity against pH values. Maximum buffering in normal milk was found to occur at approximately pH 5.50.

"The buffer intensity curve of casein determined by difference indicates that the buffer action of casein is exerted principally between pH 4.50 and pH 5.70 with a maximum at approximately pH 5.20. Casein is evidently one of the chief factors in the buffer action of milk in this range. The buffer intensity curves of purified caseins indicate that differences in methods of isolation and purification produce caseins differing from one another and from casein as it exists in milk.

"The addition of rennet to milk causes the pronounced node in the buffer intensity curve of milk to disappear. Apparently rennet converts casein into a substance with several dissociation constants within the range of pK values from 4.0 to 7.5. This conclusion is supported by the buffer intensity of paracasein determined by difference."

II. *Buffer action of calcium phosphate.*—Experimental data and theoretical considerations are used in showing the derivation of generally applicable equations for the changes in ionic equilibria in calcium phosphate solutions, both on the assumption of the presence of monocalcium phosphate as solid phase and on the assumption of tricalcium phosphate as solid phase. Calculations on the basis of these equations for initial concentrations of calcium and phosphate equivalent to those in acid whey were made. The effect of increased ionic strength on these calculated values "has been pointed out for its value in explaining some of the peculiarities in the conduct of whey."

The carbohydrate content of the proteins in the white of hens' eggs, M. SØRENSEN (*Compt. Rend. Lab. Carlsberg, 20 (1934), No. 3, pp. 19, figs. 6*).—In this study the proteins of the white of hens' eggs were divided into five fractions, largely by means of ammonium sulfate fractionation, and the amount and nature of the carbohydrates in each fraction were determined.

Globulin made up about 7 percent of the total protein and contained 4 percent of mannose. Mucin, which constituted 2 percent of the total protein, contained 14.9 percent of a mixture of equal parts of mannose and galactose. The total protein contained 70 percent of albumin which, in turn, contained 1.7 percent of mannose. Conalbumin and mucoid made up 9 and 13 percent, respectively, of the total protein and contained 2.8 and 9.2 percent, respectively, of a mixture of 3 parts of mannose and 1 part of galactose. There was 0.45

percent free glucose in the raw egg white. It is suggested that these carbohydrates were present in the form of trisaccharides, consisting of 1 mol glucosamine and 2 mols mannose or galactose.

The oxidation of cystine in non-aqueous media.—I, The solubility and stability of cystine in non-aqueous acid-base systems, G. Toennies and T. F. Lavine (*Jour. Biol. Chem., 100 (1933), No. 2, pp. 463–477*).—The main observations resulting from attempts to find a medium for the oxidation of cystine in nonaqueous solvents leading to compounds intermediate between cystine and cysteic acid were that cystine is soluble in methyl alcoholic HCl, but undergoes spontaneous esterification therein; that cystine is soluble in solutions of perchloric acid in acetic acid, but undergoes spontaneous oxidation, leading to cysteic acid in the solution; that cystine is soluble, in equivalent amount, in solutions of perchloric acid in acetonitrile, these cystine solutions being stable at room temperature; that cystine is oxidized by free $HClO_4$, while it is stable in the presence of ClO_4^- ion; and that the acid concentration of a solution of perchloric acid in acetonitrile, dehydrated by the reaction of water with acetic anhydride, decreases on standing. "No such decrease takes place when cystine equivalent to the perchloric acid is added before addition of acetic anhydride. A solution of perchloric acid and water in acetonitrile also decreases in acidity." The mechanism of these reactions is discussed.

Studies on leucine and dileucine hydrochloride and a new method for the isolation of leucine, H. M. Barnett (*Jour. Biol. Chem., 100 (1933), No. 2, pp. 543–550, figs. 2*).—The author observed that when protein materials, such as casein and wheat gluten, were hydrolyzed with HCl and the resulting hydrolysates were partially neutralized with NaOH and concentrated, one or more amino acids precipitated. A purified sample of this material was identified as leucine. The precipitation was found to be due to the salting out effect of NaCl.

A series of experiments showing the salting out of leucine at varying pH levels indicated that "regardless of the pH of the original leucine solution, over the pH range of 8.0 to 3.4 the precipitate salted out was leucine. Between pH 3.4 and 2.8 the material salted out was apparently a mixture of leucine and dileucine hydrochloride. In the pH range of 2.8 to 1.7 dileucine hydrochloride was salted out. In a more acid medium than pH 1.7 the solubility had increased to such an extent that no leucine salted out of a 2 percent solution." A solubility curve for leucine in saturated NaCl solutions at varying pH showed that, although the salting out effect extends over a wide pH range, leucine may be most completely salted out as dileucine hydrochloride at about pH 2.4. Sodium chloride in the preparations of dileucine hydrochloride was shown to be present "as a result of adhering mother liquor and therefore not in chemical combination."

The synthesis of tyrosinephosphoric acid, P. A. Levene and A. Schormüller (*Jour. Biol. Chem., 100 (1933), No. 2, pp. 583–587*).—Although no stable phosphorylated compound could be had by treating aqueous solutions of tyrosine itself with phosphorus oxychloride in the presence of magnesium oxide, the N-formyl derivative was readily esterfied by this treatment; and 2 hours' boiling in 2 N hydrochloric acid completely removed the formyl group with a concomitant decomposition of only about 10 percent of the phosphoric ester.

The tyrosine phosphoric acid obtained melted with decomposition at 253° C. and showed the specific rotation

$$[\alpha]_D^{20}=\frac{-0.20^\circ\times100}{2\times5}=-2.0^\circ.$$

The preparation of crystalline lactic acid, H. BORSOOK, H. M. HUFFMAN, and Y. P. LIU (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 449–460*).—The authors describe two methods for obtaining optically active lactic acid (both isomers) from a commercial aqueous sirup, together with a method for preparing the active isomers in a crystalline state, free of water, anhydride, and lactide. Some of the properties of the crystalline acids are given, the following physical constants being included: Melting points. *l*(+)-lactic acid. 52.8° C.; *d*(−)-lactic acid, 52.8°; *dl*-lactic acid, 16.8°; the acid dissociation constant of the three forms at 25° is pK=3.81 ±0.02.

Oxidations by erythrocytes and the catalytic influence of methylene blue.—I, The oxidation of lactate to pyruvate. II, Methemoglobin and the effect of cyanide, W. B. WENDEL (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 373–383; 385–401, figs. 4*).—The author finds, as a result of the first of the two groups of experiments here reported, that lactic acid is oxidized to pyruvic acid and hemoglobin to methemoglobin by defibrinated dog blood or erythrocytes in the presence of methylene blue. "In the absence of glucose, the amount of pyruvate formed equals or slightly exceeds the decrease of lactate, and is apparently the only product of lactate oxidation by this system. Added pyruvic acid is not attacked. Acetaldehyde was not detected. In the presence of glucose (and lactate, formed by glycolysis) more glucose plus lactate disappears than is accounted for by pyruvate formation. The excess appears to be oxidized not via lactate or pyruvate but by some unknown route to CO_2."

The experiments dealt with in the second paper showed that the rate of the oxidation of activated lactate to pyruvate is increased by semicarbazide and by cyanide, but is reduced by pyruvate. It was also observed that cyanide renders methemoglobin incapable of oxidizing the lactate.

The results reported in the two papers are discussed, in conjunction with those of other investigators, in some detail.

The action of sulfhydryl compounds on insulin, O. WINTERSTEINER (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 473–488, figs. 2*).—In following the time course of the reduction by cysteine of the disulfide linkages in three insulin preparations of different physiological strength, and of the simultaneously occurring inactivation, the author found no proportionality between maximal reduction and physiological activity. The inactivation of crystalline insulin was complete when the reduction of the disulfide groups had reached a value corresponding to about one-third of the total sulfur present. "The time course of both processes in the initial stage, however, makes it probable that reduction of a comparatively small proportion of disulfide groups suffices for the destruction of the physiological activity."

The rate of inactivation of insulin by cysteine increased with rising pH in the range pH 6 to 8. Thioglycolic acid and α-thiolactic acid inactivated insulin over that range with the same velocity as did cysteine. The presence of cyanide inhibited neither inactivation nor reduction of insulin by cysteine. The alkali-labile group of insulin was not found to be involved in the inactivation by cysteine.

The isolation of catechol from pigmented onion scales and its significance in relation to disease resistance in onions, K. P. LINK and J. C. WALKER (*Jour. Biol. Chem., 100 (1933), No. 2, pp. 379–383*).—The authors of this joint contribution from the Wisconsin Experiment Station and the Madison field laboratory of the U.S.D.A. Bureau of Plant Industry isolated catechol (3.4-dihydroxybenzene) from the outer scales of pigmented onions by means of a method involving acetone extraction, precipitation of the dried extract from aqueous solution with neutral lead acetate, decomposition of the lead precipitate with sulfuric acid, ether extraction after the solution had been rendered

slightly alkaline with sodium bicarbonate, charcoal clarification in benzene solution, and successive recrystallizations from water and from petroleum spirit by similar methods of investigation. The diphenol in question was found *not to be present in the scales of the white onion.* "Catechol, along with protocatechuic acid (3,4-dihydroxybenzoic acid), appears to be the chief toxic substance that enables the pigmented onion to resist the invasion of the fungus *Colletotrichum circinans*, the organism responsible for the onion disease known as smudge." *It appears that "the isolation of catechol and protocatechuic acid* represents the first instances wherein resistance to, or immunity from, a disease in plants has been definitely shown to be due to specific chemical compounds produced by a resistant host (the pigmented onions) and absent in a susceptible host (the white onions). Generalizations on the basis of an isolated case would be unwarranted. On the other hand, it is not without significance that the specific substances isolated from pigmented onion scales have been found in species of plants widely removed from the onion."

The physico-chemical properties of pectin, P. B. Myers and G. L. Baker (*Delaware Sta. Bul. 188 (1934), p. 23*).—Analyses in continuation of earlier work (E.S.R., 65, p. 407) are reported.

The resins, rev. by A. Tschirch and E. Stock (*Die Harze. Berlin: Borntraeger Bros., 1933, 3. ed., rev., vol. 1, pp. XV+418, pls. 3, figs. 131*).—This first volume of the projected work contains only the first or general part. Chapter 1, on the word "Harz" and its meaning, takes up the etymology and synonymy of the term and its definition. Succeeding chapters consider the formation of such secretions by the plant and the methods for obtaining resins; the morphological, the physical, and the chemical properties of the resins; adulterations; medical uses and technical applications; production and commerce; and history.

The biological and chemical nomenclature for the carotenoids, L. S. Palmer (*Science, 79 (1934), No. 2056, pp. 488–490*).—The author discusses the unsatisfactory and confusing nomenclature in use at the present time for ketonic and alcoholic carotenoids and proposes a new generic and chemical nomenclature for the various carotenes and carotenoid derivatives. Several references to the literature are included.

A rich source of β-carotene, W. L. Brown (*Science, 79 (1934), No. 2056, p. 481*).—In this brief note from the Georgia Experiment Station attention is called to the Perfection pimiento as a rich source of β-carotene apparently free from α-carotene. The yield of β-carotene from dried pimiento shells is said to be 200 to 665 mg per kilogram.

New pharmacopoeial standards for cod liver oil, E. F. Cook (*Amer. Jour. Pharm., 106 (1934), No. 5, pp. 178–180*).—This announcement of the new pharmacopoeial standards for vitamins A and D and vitamin assays which will become official on January 1, 1935, includes the new U.S.P.X. cod-liver oil minimum standards for vitamins A and D in terms of U.S.P. 1934 units (E.S.R., 71, p. 298) and conversion factors for vitamin A and D units. The latter include, in addition to the ones given previously, the equivalent of one international vitamin D unit in terms of Oslo vitamin D units (1.66) and the equivalent of the new U.S.P. minimum standard of 85 U.S.P.X. (1934) vitamin D units per gram of oil in Steenbock (31.5), A.D.M.A. (276), and Oslo (142) units.

The chemistry of vitamins A and C, P. Karrer (*Chem. Rev., 14 (1934), No. 1, pp. 17–30*).—This lecture, given at the September 1933 meeting of the American Chemical Society, constitutes a concise review of the investigations of the author and his associates on the chemical constitution of vitamins A and C, with references to the contributions of other investigators along the same lines.

Recent contributions to our knowledge of the chemistry of vitamin A, M. T. Bogert (*Jour. Chem. Ed., 11 (1934), No. 4, pp. 203–207*).—"The steps leading up to the recent synthesis of perhydro vitamin A by Karrer and his coworkers are reviewed concisely, as well as other attempts made to reach this same goal. The significance of ionene as a degradation product of vitamin A is discussed, and the synthesis of the former is outlined. The possibility of many vitamin A isomers is pointed out and the fascinating opportunities of startlingly important discoveries in this field of investigation."

A list of 16 references to the literature is appended.

An attempt to isolate vitamin A, H. N. Holmes, H. Cassidy, E. Hartzler, and R. Manly (*Science, 79 (1934), No. 2046, pp. 255, 256*).—In this preliminary note the authors announce the isolation from the nonsaponifiable portion of halibut-liver oil of a concentrate said to be considerably more active as a source of vitamin A than any hitherto reported. Preparations of the concentrate have had cod-liver oil values ranging from 13,000 to approximately 14,000, with a number ranking above 10,500, the highest value previously reported. Inasmuch as the richest product is still in the form of a viscous oil, no claim is made as to its purity. A brief description is given of the method followed in the concentration.

Activity of crystalline preparations of vitamin B_1, A. G. van Veen (*Nature [London], 133 (1934), No. 3352, p. 137*).—The author has confirmed the announcement by Kinnersley, O'Brien, and Peters (E.S.R., 70, p. 153) that their crystalline vitamin B_1 concentrate is more active than any hitherto prepared, and announces that by improvements in his own method of isolating vitamin B_1 (E.S.R., 69, p. 326) he has succeeded in obtaining a crystalline product which is about twice as active as his former preparation and probably more active than the Peters preparation. The minimum protective dose of the new crystals is 0.8γ for ricebirds and 1.5γ or a little more for young rats. One g of the preparation is said to be equal to about 500,000 international standard units.

Activity of crystalline preparations of vitamin B_1, H. W. Kinnersley, J. R. O'Brien, and R. A. Peters (*Nature [London], 133 (1934), No. 3353, p. 177*).—Referring to the report of Van Veen noted above, the authors call attention to the differences in composition between the crystals prepared by Van Veen and by themselves and state that at present these differences cannot be reconciled with the published results of X-ray analysis.

Preliminary note on the structure of ascorbic acid (vitamin C), P. A. Levene and A. L. Raymond (*Science, 78 (1933), No. 2012, p. 64*).—The authors discuss briefly the possible structure of ascorbic acid on the basis of hydrogenation experiments.

Unlocking another door to nature's secrets—vitamin C, W. A. Waugh (*Jour. Chem. Ed., 11 (1934), No. 2, pp. 69–72*).—This is a concise review of the literature on the chemical properties, methods of determination, isolation and identification, and occurrence and physiological properties of vitamin C. An extensive list of references is appended.

The relation of reducing value and extent of browning to the vitamin C content of orange juice exposed to air, M. A. Joslyn, G. L. Marsh, and A. F. Morgan (*Jour. Biol. Chem., 105 (1934), No. 1, pp. 17–28, fig. 1*).—Comparisons are reported of the vitamin C content as determined biologically with the ascorbic acid content as determined both by iodine titration and by indophenol titration of samples of Valencia and navel orange juices after storage in air for different lengths of time. The Valencia juice and one sample of the juice from navel oranges were mixed with diatomaceous earth and filtered

brilliantly clear by suction, and another sample of the navel orange juice was simply strained through cheesecloth. Sodium benzoate, 0.2 percent, was added to all samples. After stated periods of storage in air some of the juice was frozen and held at −17° C. for analysis.

Loss of vitamin C was found to accompany decreases in the iodine-reducing and indophenol-reducing values of the orange juices and to occur at about the same rate. The correlation was much closer with the Valencia than with the navel oranges.

As suggested in a preliminary report (E.S.R., 67, p. 503), the extent of browning of the juice paralleled the extent of loss of vitamin C. Navel orange juice had a higher concentration of reducing substances than Valencia and probably more reducing material other than ascorbic acid.

The authors conclude that there is little choice between the indophenol and iodine titration in estimating changes in vitamin C content during prolonged oxidation of orange juice, but that the iodine titration is superior to the indophenol in practice, as it can be carried out more easily and duplicated more readily.

Studies on D-vitamin.—V, Determination of the antirachitic property of sunlight [trans. title], A. Jendrassik and S. Papp (*Biochem. Ztschr.*, *268* (*1934*), *No. 4–6*, *pp. 364–368*, *figs. 3*).—This paper contains a description of the apparatus developed for estimating the antirachitic value of sunlight by means of the activation of ergosterol, as described in the previous paper (E.S.R., 70, p. 284), and a summary of the data obtained in the application of the method to the determination of the antirachitic value of the sunlight in Budapest at different seasons of the year.

The vitamin D potency of the ergosterol solution exposed to sunlight for 5 hr. at different seasons of the year varied from 7 international units per milligram in December to 2,300 units in June.

A comparison of international units of vitamin D in a sample of ergosterol irradiated for 5 hr. under varying light conditions in the month of September gave the following values: Full sunshine 550, variable weather 285, cloudy sky 60, and in the shade on a sunny day 300 international units per milligram.

Absorption spectrum of the vitamin E fraction of wheat-germ oil, P. Bowden and T. Moore (*Nature* [*London*], *131* (*1933*), *No. 3310*, *p. 512*, *fig. 1*).—The vitamin E fraction of wheat germ oil obtained by saponification of the oil by alcoholic potassium hydroxide at 37° C., followed by extraction with ether and removal of sterols from the nonsaponifiable residue by crystallization and precipitation by digitonin, gives an absorption spectrum characterized by three well-defined bands in the blue with maxima at 4,850, 4,520, and 4,260 a.u. In the ultraviolet region stronger absorption began at 3,020 a.u., with a well-defined maximum at 2,550 a.u., followed by general absorption from 2,400 a.u. down.

The absorption bands were not affected by prolonged exposure of the concentrate to oxygen or air at room temperature. The absorption in the far ultraviolet at 2,400 a.u. was slightly increased by exposure to H_2O_2, and all of the bands except at 2,550 a.u. were destroyed in a few seconds by a stream of 10 percent ozone.

"The concentrate was not sensitive to light of wave lengths longer than 4,000 a.u., but exposure to the full light of a mercury arc for a period of 45 min. destroyed the bands in the visible spectrum as well as the incipient absorption at 3,020 a.u. and 2,860 a.u. The band at 2,550 a.u. was, however, again but little changed."

Absorption spectrum of the unsaponifiable matter from wheat-germ oil, R. A. Morton and J. R. Edisbury (*Nature* [*London*], *131* (*1933*), *No. 3313*, *p.*

618).—Hitherto unpublished data on the absorption spectrum of vitamin E fractions of wheat germ oil are reported in confirmation of the observations of Bowden and Moore noted above.

The manganese content of grasses and alfalfa from grazed plots, D. W. Bolin (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 7, pp. 657–663*).—The author of this contribution from the Idaho Experiment Station describes a new method for the determination of manganese in plant material by the fusion of the plant ash with anhydrous sodium carbonate. The method gave a recovery of manganese greater than that obtained by the Official methods.

"One to two grams of the air-dry material to be analyzed was weighed into a platinum dish and ashed overnight in an electric muffle at 600° C. The ash was then fused with 3 g of anhydrous sodium carbonate. After cooling, the fused mass was placed in a 250-cc beaker and covered with a watch glass. Distilled water was added in sufficient quantity to moisten the sample and then 15 cc of 20-percent sulfuric acid (by volume) was added. When the fused material was dissolved, it was washed from the platinum crucible with a few cubic centimeters of 5-percent sulfuric acid. A few drops of 15-percent sodium bisulfite were added to the solution until all the manganese was reduced to manganous sulfate. The solution was then boiled to expel excess sulfur dioxide, filtered, and the acid-insoluble residue washed with several small portions of 5-percent sulfuric acid.

"To the filtrate was added approximately 0.3 g of potassium periodate. The beaker was covered with a watch glass and its contents boiled for 5 minutes. The solution was allowed to stand for 1 hour at a temperature of 95° to 100° C. to insure complete oxidation of the manganese. The solution was then diluted to 90 to 95 cc with 5-percent sulfuric acid previously boiled with a little potassium periodate, and cooled to room temperature, the entire sample transferred to a 100-cc colorimetric tube and compared in a colorimeter with a standard manganese solution. A standard solution containing 0.0025 mg of manganese per cubic centimeter was a satisfactory one to use."

The average manganese content (dry basis) of eight grasses ranged from 207.5 mg per kilogram for orchard grass to 78.1 mg per kilogram for Kentucky bluegrass. Alfalfa, with an average of 46.6 mg per kilogram, was lower in manganese than any of the grasses. "The eight grasses varied markedly in their capacity to extract manganese from the soil."

Note on the precipitation of small amounts of potassium as potassium sodium cobaltinitrite, R. S. Hubbard (*Jour. Biol. Chem.*, *100* (*1933*), *No. 2, pp. 557–559*).—To centrifuge tubes containing each 1 cc of a solution containing from 0.05 to 0.8 mg of potassium there are to be added 1 cc each of a solution of sodium acetate (100 g of crystalline salt made to 250 cc with distilled water), followed by 1 cc of a sodium cobaltinitrite solution prepared according to the method of Kramer and Tisdall (E.S.R., 45, p. 507). The tubes are then to be set in ice water for between 0.5 and 2 hr. Acid up to an equivalent of 0.1 cc of concentrated nitric acid did not affect the determination, and it was not necessary to take any precautions as to the rate of adding the reagent. Remove the tubes from the cooling bath and centrifuge. Wash the precipitate two or three times, preferably with suitable organic solvents ("acetone diluted with 3 parts of water was convenient for the first and pure acetone for subsequent washings"), dissolve, and titrate with 0.02 N $KMnO_4$. "Precautions essentially similar to those of Kramer and Tisdall were used to prevent the loss of nitrous acid during titration. . . .

"If desired, the potassium could be freed from interfering organic substances by one of two methods. The washed precipitate first obtained could be treated with 0.1 cc of concentrated HNO_3 on a boiling water bath, and the potassium

reprecipitated as described above or the precipitate could be dried, a small crystal of $Na_2CO_3.10H_2O$ be added (anhydrous sodium carbonate did not mix well with the precipitate, and when solutions were used loss from bumping was usual), and an alkaline fusion be carried out. After the latter procedure, the cobalt oxide was dissolved by the aid of heat in 0.1 cc of a solution containing equal parts of concentrated H_2SO_4 and water, and the potassium reprecipitated as described. Either technic gave satisfactory recovery of potassium, and the alkaline fusion removed large amounts of organic compounds and ammonia added to the fusion mixture."

A new colorimetric method for the quantitative estimation of small amounts of potassium, A. E. Sobel and B Kramer (*Jour. Biol. Chem., 100 (1933), No. 2, pp. 561–571, fig. 1*).—The applicability of the colored cobalt-cysteine-hydrogen peroxide complex to the quantitative estimation of cobalt was studied, the potassium content of 0.2 cc of solutions containing from 10 to 40 mg percent of potassium having been estimated by the colorimetric determination of cobalt in the cobaltinitrite precipitate with an average error of ±1.9 percent. The atomic ratio of the potassium to cobalt in the potassium conbaltinitrite precipitate under the conditions prescribed was found to be 2:1.2. The olive-green colored complex formed by cobalt and cysteine in alkaline solution was found to be so altered by hydrogen peroxide as to yield a bright yellow complex, of which the color intensity was " about five times as great as that of the first complex," the last-named substance forming the basis for the colorimetric procedure.

A manometric micromethod for determination of carbon in organic compounds, D. D. Van Slyke, I. H. Page, and E. Kirk (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 635–649, figs. 2*).—In this procedure the organic material is subjected to wet combustion with a mixture of chromic, sulfuric, and phosphoric acids in a tube attached to the chamber of the Van Slyke-Neill (E.S.R., 69, p. 172) manometric apparatus. The carbon dioxide formed is drawn over into the chamber and absorbed with dilute alkali solution. The unabsorbed gases are ejected, and the carbon dioxide is set free by acidification and is measured manometrically, as in the determination of carbon dioxide in blood. "An analysis requires about 10 min. The accuracy is of the order of 1 part in 200 with 0.2 to 0.6 mg of carbon and the usual manometric chamber used for blood gases. With samples of 1 to 3 mg of carbon and a manometric chamber which brings the gas to 10 instead of 2 cc for pressure measurement, the accuracy is of the order of 1 part in 500." Two forms of the procedure are described: Method A, in which the carbon dioxide content of the air initially present in the 15-cc combustion tube is neglected: and method B, in which a slightly modified set-up permits the removal, by means of carbon dioxide-free sodium hydroxide solution, of even this minute source of error.

Improvements in manometric micro-Kjeldahl and blood urea methods, D. D. Van Slyke and V. H. Kugel (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 489–497*).—The Stehle device (E.S.R., 45, p. 11) of replacing the usual alkaline hypobromite solution by separate solutions of sodium hydroxide and of bromine in aqueous potassium bromide solution, which are mixed for each analysis, has been found not only to give the advantage of a stable bromine solution but also to eliminate error from spontaneous generation of oxygen gas which occurs in standing solutions of alkaline hypobromite The potassium bromide was also shown to prevent fouling of the apparatus with mercuric bromide precipitates. This type of hypobromite reagent, in a form adapted to the manometric methods, proved its convenience and accuracy in routine micro-Kjeldahl and blood urea determinations.

The Somogyi procedure (E.S.R., 64, p 713) for precipitating the blood proteins with zinc hydroxide removed the greater part of the nonurea substances, present in tungstic acid filtrates, which evolve nitrogen when treated with hypobromite. In blood samples containing less than 50 mg of urea nitrogen per 100 cc, the use of the Somogyi filtrate decreased the average error of the hypobromite method, checked by careful gasometric urea analyses, to ±0.2 mg of urea nitrogen per 100 cc. The use of this filtrate "therefore makes the hypobromite method exact enough for blood urea clearances."

Determination of ammonia in blood, D. D. Van Slyke and A. Hiller (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 499–504*).—The authors aerated the ammonia from the blood sample into an acid-receiving solution by means of customary procedures, but employed for determining the ammonia obtained, instead of nesslerization, the blue color developed when ammonia is heated with an alkaline solution of phenol and hypochlorite (Berthelot's reaction).

"We have found that the phenol reagent, when applied as described . . . , is more sensitive than Nessler's solution. . . . A dilution of 0.001 mg of ammonia nitrogen in 5 cc of solution (the minimum obtained in blood analyses) is just beyond the limit at which Nessler's solution gives a perceptible color; but with this dilution the phenol reagent still yields sufficient color for approximate quantitative determination. Furthermore, the blue product of the phenol reaction behaves like a true solution, with no tendency to precipitate, while the colored product obtained as a result of Nessler's reaction is highly insoluble, and its colloidal solution is likely to flocculate in the presence of traces of caprylic alcohol." The reagent last named is often carried over, when used in the aeration to prevent foaming of the blood samples, in quantities sufficient to cause flocculation of the mercury-ammonia complex.

A convenient and accurate method for the determination and detection of carbon monoxide in blood, A. A. Christman and E. L. Randall (*Jour. Biol. Chem., 102 (1933), No. 2, pp. 595–609, fig. 1*).—The authors describe a simple method, requiring only inexpensive apparatus, and capable of determining carbon monoxide representing only 1 percent of the saturation capacity of the hemoglobin content of a 2-cc sample of blood.

"The blood gases, including carbon monoxide, are released from the blood under reduced pressure by the action of acid ferricyanide solution. The resulting gas mixture is passed into a bulb containing palladium chloride solution. The carbon monoxide reacts with the palladium chloride according to the following equation: $CO+PdCl_2+H_2O=Pd+CO_2+2HCl$. After the above reaction is completed, the excess palladium chloride is separated from the metallic palladium by filtration, and the palladium chloride is determined colorimetrically. The addition of potassium iodide in excess of that required to precipitate the palladium chloride as palladous iodide redissolves the palladous iodide to give a red solution, which in the presence of a protective colloid such as gum ghatti remains perfectly clear for at least 24 hr. The red color is easily matched, and . . . the intensity of the color is almost exactly proportional to the amount of palladium chloride present over a wide range of concentrations."

The determination of reducing sugars by titration of ferricyanide, S. W. Cole (*Biochem. Jour., 27 (1933), No. 3, pp. 723–726, fig. 1*).—The author finds that the addition of methylene blue to an alkaline solution of ferricyanide enables one to estimate reducing sugars by direct titration very rapidly and accurately. "The indicator is not reduced until the whole of the ferricyanide has been reduced, and the end point, being a change from a blue or violet solution to one that is colorless, is unmistakable."

He carries out the reaction in narrow-necked 100-cc flasks, and prefers graduated pipettes to burettes, adjusting the concentration of the sugar solution

so that from 3 to 5 cc will be required. "By holding the pipette nearly horizontally it will be found that deliveries of about 0.02 cc can be made, the condensing steam washing the drop off the end of the pipette." If more than 10 cc of the sugar solution must be used, the author prefers a pinchcock burette.

"*Rough titration.*—To 20 cc of the ferricyanide and 5 cc of the NaOH in a 100-cc flask, add a pinch of broken porcelain. Heat to boiling on a wire gauze over a Bunsen flame. Add the sugar solution slowly until the yellow color has appreciably decreased. Then add a small drop of methylene blue. Continue to add the sugar until the fluid is decolorized, allowing a few seconds between each addition. The exact equivalents are given . . ., but as a rough guide it can be stated that about 1 cc of a 2 percent or 2 cc of a 1 percent solution of glucose are necessary.

"*Final titration.*—The standard conditions are as follows: To 20 cc of the ferricyanide and 5 cc of the NaOH are added a pinch of broken porcelain and one small drop of methylene blue. To the cold mixture is added all but about 0.2 cc of the volume of sugar solution judged to be necessary from the preliminary trial. The mixture is brought to the boil in about 1¾ min. The flame is then lowered a little, so that only gentle boiling is obtained. After 1 min. the remaining sugar is added, a drop at a time, at 10- or 15-sec. intervals, until the end point is reached. The total boiling time should be over 2 min. and must not exceed 3 min."

Equivalents for glucose, maltose, and lactose are given; a method for the estimation of sucrose is described; methodic details for the estimation of lactose in milk and of glucose in urine are given; a method for the estimation of maltose and glucose in a mixture of these sugars is described; and the calculation of the results is explained and illustrated. A curve from which grams of glucose per 100 cc can be read off is also shown.

Biological method for the determination of different sugars in starch degradation products, A. Schultz and G. W. Kirby (*Cereal Chem., 10 (1933), No. 2, pp. 149–155*).—The present paper describes a method of selective fermentation which has been employed for the determination of dextrose or levulose, sucrose, and maltose in the presence of each other. "The method involves the use of (1) a pure culture of an air-borne organism which has been classified by us as a mycoderma and which ferments dextrose or levulose but does not ferment sucrose or maltose, (2) an active invertase preparation, and (3) fresh bakers' yeast.

"Dextrose or levulose was determined by collecting and measuring the volume of carbon dioxide produced by complete fermentation with the mycoderma organism. At the completion of this fermentation, a sugar-free and maltase-free invertase preparation was added to the reacting solution, and the volume of carbon dioxide then evolved is taken as the measure of the sucrose present. The total fermentable sugar was determined by fermentation with bakers' yeast. The difference between the carbon dioxide thus obtained from the total sugars and that which is equivalent to the sum of dextrose and sucrose was calculated to maltose."

A comparison of the Minnesota and the Mojonnier tests for fat in ice cream, P. S. Lucas (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 281–283*).—A study of the accuracy of the Minnesota fat test as compared with the Mojonnier test was made with 50 samples of ice cream selected at random from various dealers. All samples were tested by both methods.

In every case the Minnesota test gave a slightly higher reading than the Mojonnier test. The average difference amounted to 0.512 percent with a mean difference of 0.52 percent. This difference was so small that it did not

invalidate the method, but it is recommended that it be given consideration when the method is used. Because the Minnesota method is simple and checks closely between duplicate samples, it is recommended as a very practical method.

A study of the march of acidity in stored flours and some critical remarks of the methods used for the determination of flour acidity, A. Schulerud (*Cereal Chem., 10 (1933), No. 2, pp. 129–139, fig. 1*).—From a study of samples from three commercially stored rye flours and one patent wheat flour similarly treated, the author concludes in part that the figures representing the total increase in acidity, within the same flour, are approximately the same as obtained by all the methods used; that 96 percent alcohol extracts more acid than ether, and 67 percent alcohol extracts more acid than 96 percent alcohol; and that the differences between the methods used are practically constant during the examination period, "i.e., the fatty acids are alone responsible for the increase in acidity." The quantity of P_2O_5 and the titer of the filtrates from 48-hr. suspensions kept in thermostats at 40° C. with formic aldehyde added to prevent fermentation were constant. "The P_2O_5, when calculated as KH_2PO_4, very nearly covers the titers of the extracts."

It is pointed out that "besides the ash, the fat contents of the flours should be recognized as a factor important for flour acidity."

A method for testing for ropiness of bread, H. H. Bunzell and M. Forbes (*Cereal Chem., 7 (1930), No. 5, pp. 465–472, figs. 2*).—The authors report upon a method for measuring the relative abundance in a bread of the organism *B[acillus] mesentericus*, the cause of "ropiness", in terms of the rate of decomposition of hydrogen peroxide by the catalase produced by the organism. Drawings of an apparatus in which a manometric estimation of the evolved oxygen may be carried out accompany the paper, which contains a description of the instrument and directions for its operation. A tentatively proposed unit of infection with *B. mesentericus* is "that degree of infection which will cause liberation in 5 min. of 1 mg (0.000001 g) of oxygen per gram of bread which has been incubated at 50° C. for 24 hr."

The paper records also results of experiments with acid calcium phosphate as a preventive of ropiness. The conclusion is reached that a quantity of this salt slightly greater than 0.5 percent of that of the flour used is sufficient to prevent the development of the trouble.

AGRICULTURAL METEOROLOGY

World weather and solar activity, H. H. Clayton (*Smithsn. Misc. Collect., 89 (1934), No. 15, pp. 52, figs. 26*).—This is the sixth of a series of papers giving the results of investigations of the relation of solar activity to atmospheric changes (E.S.R., 63, p. 416). The features especially stressed in the paper are "(1) The world-wide correlations of atmospheric changes, as indicated by a similarity in these changes in both the Northern and Southern Hemispheres and in widely separated continents and oceans. In some cases the changes are directly similar, and in others the changes are directly opposite—that is, when one increases the other decreases. (2) A relationship is found between atmospheric changes and sun-spot activity, and an even closer relationship with changes in solar radiation. (3) Centers of action in the atmosphere are found to shift position under the influence of changes in the intensity of solar activity. This is a fact of great importance to be considered in correlating the weather between distant places, in studying the question of periodicity in the weather, and in tracing atmospheric movements of a wavelike nature."

Climatological data for the United States by sections, [January–February 1934] (*U.S. Dept. Agr., Weather Bur. Climat. Data, 21 (1934), Nos. 1, pp. [202], pls. 3, figs. 2; 2, pp. [202], pls. 3, figs. 2*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Meteorological observations, [May–June 1934], C. I. Gunness, H. Jenkins, and F. Shaw (*Massachusetts Sta. Met. Ser. Buls. 545–546 (1934), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

A comparison of temperatures in air and at various depths in a light sandy soil in southern Ontario, D. A. Kimball, G. N. Ruhnke, and M. P. Glover (*Sci. Agr., 14 (1934), No. 7, pp. 353–359, figs. 4*).—Observations made during the period July 9, 1930, to July 10, 1932, are stated to indicate among other things that both in summer and winter "the daily or weekly variations in temperature are greatest in air and become less for each increase in soil depth. Winter temperatures show less weekly variation in air and slightly greater changes in all depths of soil than do the summer records. The daily temperature range is much less for air in winter than in summer and about the same for all soil depths both winter and summer. . . . Soil temperatures evinced a much more regular rise and fall than did air temperatures. Winter soil temperatures, although changing slowly in direct relation to air temperature, do not show any definite lag therefrom nor any regular variation in time."

A number of references to similar work by other investigators are given.

Climatic studies in Oubangui-Chari [trans. title], A. P. Moreau (*Coton et Cult. Coton., 8 (1933), No. 3, pp. 171–176*).—This is a chapter in a monograph on cotton and cotton culture in French Equatorial Africa, discussing briefly the relation of temperature and the amount and distribution of rainfall, hail, and humidity during the season of 1932–33 to cotton culture in Oubangui-Chari.

SOILS—FERTILIZERS

The historical development of soil investigation and of its critical interpretation, F. K. Czibulka (*Die geschichtliche Entwicklung der Bodenuntersuchung und deren kritische Betrachtung. Diss., Tech. Hochsch., München, [1931], pp. 88*).—The contents of this doctor's thesis are, following a brief introduction, (1) the beginnings of soil investigation in ancient times, (2) the further development in the middle ages and later years up to the appearance of Liebig, and (3) the history of the development of physical soil investigation (under which head are included subsections on mechanical soil analysis, soil physics from Schübler to Wollny, investigations of Wollny and further development, colloid chemistry of the soil—an offshoot of soil physics, and the determination of soil structure). The fourth main division of the thesis concerns the historical development of the determination of chemical properties and of the fertilizer requirements of the soil, and the fifth, microbiological soil investigation as an outlook upon the future of the science. A brief summarizing discussion of the material brought together in the five chapters named and a bibliography of more than 300 references conclude the work.

Soil analysis: A handbook of physical and chemical methods, C. H. Wright (*London: Thomas Murby & Co.; New York: D. Van Nostrand Co., 1934, pp. VIII+236, figs. 6*).—"It is with the object of . . . providing research workers and those engaged in the routine examination of soils with a laboratory manual that this book has been written. Great care has been taken to include all the working details of each method. Under each heading is given a d

scription of the method as it was originally described in the publication referred to; any additional information and comments by me are included in footnotes. Data required in calculating the results are given for easy reference, but no attempt has been made to explain the theoretical principles on which the methods are based."

Part 1, on physical methods, contains chapters on preparation of the soil sample, moisture, loss on ignition, Keen-Raczkowski measurements, moisture equivalent, moisture content at different humidities, heat of wetting, moisture content at the point of stickiness, soil shrinkage, density and pore space, mechanical analysis, colloids, and hydrogen-ion concentration. Part 2 includes under the main caption general chemical methods, procedures for the determination of manganese, calcium, magnesium, potassium, sodium, and phosphoric acid, and also takes up indicators for volumetric analysis and standard solutions for volumetric analysis. Part 3 deals, under the general head of special chemical methods, with nitrogen, ammonia, nitrites, nitrates, carbon dioxide, carbon, organic matter, mineral constituents, silica to alumina ratios, hydrochloric acid extracts, available phosphoric acid and potash, water extracts including salt content, soil solutions, and base exchange. The three appendixes consist of tables of international atomic weights, gravimetric factors and their logarithms, and strengths and equivalent values of standard solutions.

An introduction to tropical soils, P. VAGELER, trans. by H. GREENE (*London: Macmillan & Co., 1933, pp. XVI+240, pls. 12, figs. 13*).—In a foreword to this translation, E. J. Russell says of the author of the original that "in this book he summarizes his impressions and his experiences with tropical soils. It is not a textbook in the ordinary sense, and it makes no pretense of being an index to the extensive literature now grown up around the subject. It is, however, for that very reason easier to follow, and it does convey a good impression to the reader of what tropical soils really are like. Those who have been out and who have seen them will recognize the picture and appreciate the details supplied by so good an observer; those who have never seen them will be enabled to visualize them better than would otherwise be possible."

The further contents are an introduction; chapters on problems of tropical pedology; rocks and minerals considered as the parent material of soil and in relation to soil fertility; forms of vegetation in the tropics and subtropics as sources of organic substances in the soil; climate, relief, and vegetation in the formation of tropical and subtropical soils; the formation of tropical and subtropical soils; soil selection; physical aspects of the choice of crops and soil management; and chemical aspects of the choice of crops and soil management. Appendix 1 contains a table for determination of the most important soil minerals; appendix 2, the principal igneous rocks; and appendix 3, a short list of references for the English-speaking reader.

[Soil studies in Alabama, 1932] (*Alabama Sta. Rpt. 1932, pp. 14–18*).—The station's soil work is discussed under the heads, phosphate studies in solution cultures and the occurrence of an oxidizing agent in solutions in which the ammonium ion was used as the source of nitrogen, both by A. L. Sommer; properties and fertilizer response of certain soil types, by F. L. Davis; and fixation of phosphates by soil colloids and fixation of phosphates by an acid, heavy clay soil, both by G. D. Scarseth.

[Soil investigations of the Delaware Station] (*Delaware Sta. Bul. 188 (1934), pp. 17, 23, 24, 47*).—Brief notes are given on studies of the control of the H-ion concentration of Sassafras silt loam, by H. C. Harris; electrodialyzable bases in the colloidal fraction of a subsoil, by P. B. Myers and G. M. Gilligan; the effect of lime on the availability of potash and phosphoric acid,

by Gilligan; and response to copper and manganese compounds as regards soil nitrogen fixation, by T. F. Manns.

[**Soil and fertilizer report of the Maryland Station**] (*Maryland Sta. Rpt. 1933, pp. XXVII, XXVIII*).—Brief notes are given on field studies of the fertility requirements and management of important soil types and availability of phosphorus in Maryland soils.

Soil dynamics, A. Demolon (*La Dynamique du sol. Paris: Dunod, 1932, pp. XII+347, pls. 2, figs. 56*).—Following a brief historical retrospect and a definition of the soil, with the author's views as to the delimitation of the field of soil science, this treatise is divided into three parts dealing, respectively, with physical, chemical, and biological phases.

Part 1 contains chapters on general concepts concerning the parent rock, the genesis and morphological classifications of soils, the general properties of disperse systems, the mineral and the humic colloids of the soil, mechanical analysis of the soils, internal structure of soils and their porosity, relation between soils and water, and the soil and radiant energy. Part 2 similarly deals with soil reaction, the absorbing power of soils, the soil solution, and the so called assimilable elements of the soil. Part 3 takes up the movement of the soil population, the biochemical evolution of carbon in the soil, the biochemical evolution of nitrogen, and the concept of fertility. An appendix deals with methods of soil analysis

Laws of soil colloidal behavior.—XIV, Aging of colloids and base exchange, A. J. Pugh (*Soil Sci., 37 (1934), No. 5, pp. 403–427, pl. 1*).—Having continued the work of Falconer and Mattson (E.S.R., 70, p. 589), the author of the present contribution from the New Jersey Experiment Stations reports experiments in which the increased activity of the H ion during the aging of aluminum hydroxide and silicate was studied, together with the flocculation in barium acetate solution and diminished adsorption capacity on aging.

"Both the hydroxide and silicate were synthesized by hydrolysis of the chloride, the oxygen of the hydroxyl group or the silicate group combining with the aluminum ion through the lone pair of electrons of the oxygen. This is by definition a covalent bond, but the molecules of the freshly prepared colloids are unsaturated, the aluminum having only six shared electrons but requiring eight for stability. The hydrogen, because of its small volume and consequent high mobility, dissociates in a water suspension, and the lone pair of the oxygen are transferred to the aluminum, increasing the number of shared electrons by two, the aluminum becoming quadrivalent and saturated. This leads to continuous polymerization until all the material is exhausted and gives an unsaturated molecule. The freshly prepared sol is stable in a solution of barium acetate, but the 3-week-old sol flocculates rapidly because of the increased size of the particles. It is therefore suggested that a particle of Ba-colloid may thus be actually smaller than that of a H-colloid, provided the barium is added to the freshly prepared colloid."

The bearing of this on current theories of base exchange and the structure of clay is briefly discussed. The strong adsorption of the H ion is attributed to the fact that it is the only cation that can form a covalent bond with two shared electrons, "whereas the other cations must be held by electrostatic attraction, as they require a group of eight for stability. Iron and aluminum when combined with bentonite are not afterwards removed by leaching with ammonium chloride, the combination with the lone pair of the oxygen taking place with the unsaturated hydroxides."

The dispersion of soils in mechanical analysis ([*Gt. Brit.*] *Imp. Bur. Soil Sci., Tech. Commun. 26 (1933), pp. 32*).—"As a result of the examination

of 120 representative samples of soil, mainly overseas but including a few British soils, it appears that the International method with suitable modifications gives satisfactory dispersion in mechanical analysis. The principal modification consists in the substitution of sodium hydroxide for ammonia as a dispersing agent. The dispersion thus attained is so efficient that the amount of shaking required may be appreciably reduced. For most soils the proposed modification gives results which agree fairly clearly with those by the International (ammonia) method.

"The difficulty with gypseous soils may be obviated by removing coarse gypsum after peroxiding and before acid treatment, using a stronger acid, and washing with 10 percent ammonium acetate.

"Oxidation of organic matter by hydrogen peroxide appears to be necessary with all soils containing more than about 1 percent of organic carbon. By including a preliminary boiling with water, it is possible to secure oxidation with more dilute (2 percent) peroxide. Manganese dioxide, which interferes with peroxide attack, may be decomposed by preliminary digestion with water and $NaHSO_3$. Aluminous soils present a special difficulty as they are not dispersible in alkaline solution. Dispersion may be effected in a slightly acid medium."

Effect of various factors on the soluble manganese in soils, M. M. McCool (*Contrib. Boyce Thompson Inst., 6 (1934), No. 2, pp. 147–164, figs. 2*).—Experiments carried out upon a number of soil types showed that the manganese content of water extracts of samples of soil taken at different depths below the surface and at different times of the year varied widely. It was lowest in spring after heavy precipitation and in the autumn. The largest concentrations were found near the surface in August and in soil which contained decaying sod. More manganese was present in extracts of soils held at high water contents than was contained in those from soils maintained at lower water contents. Changes in the manganese content of extracts from soils held through different periods of time, 3, 15, and 30 days at 35° F., were slight. The quantity of water-soluble manganese in the soils held at 72° and 100° increased as the experiment progressed and was greatest in those maintained at the higher temperature.

Steam heating 6 soils 3 hr. at 240° greatly increased the concentration of manganese in their soil extracts. After letting such extracts stand at room temperature 15 days, the quantity in solution decreased greatly. The subsequent changes, during 30 and 60 days after treatment, were not so great. The soluble-manganese content of samples taken from the subsoils of Dover silt loam, Dutchess silt loam, Podunk silt loam, and Merrimac sandy loam, with the exception of the one removed 24 to 36 in. from the surface of Dover silt loam, was increased only to a slight extent by steaming. Organic matter appeared to play an important role in the release of manganese to the extracts upon steaming these soils. The manganese content of solutions displaced from 6 steamed soils was very high, ranging from 384 p.p.m. in that from the Dover silt loam to 22.9 p.p.m. in that from the Podunk silt loam.

The addition of calcium hydroxide to 6 soils before steaming resulted in great decreases in the water-soluble manganese content as compared with that of samples which had not been limed; but, although the extracts of 3 of the soils were alkaline in reaction, they carried some manganese. The addition of ammonium sulfate, superphosphate, and mixed fertilizer to Merrimac sandy loam and Podunk silt loam increased the manganese content of their soil extracts.

Finally, "plants grown in steamed soils contained much larger amounts of manganese and developed leaf characteristics similar to, if not identical with,

those produced in soils to which excessive amounts of manganese were applied. The harmful action of steamed soils toward several kinds of plants was prevented by commercial fertilizers."

Classification of land on a geographic basis, J. O. Veatch (*Mich. Acad. Sci., Arts, and Letters, Papers, 19 (1933), pp. 359–365; abs. in Michigan Sta. Quart. Bul., 16 (1934), No. 4, p. 295*).—A scheme for the classification of land on a physical basis is described. The classification is based upon physiographic divisions but also takes into consideration the soil and vegetation. The minor divisions comprise peculiar associations, or complexes, of soil and topographic features. Such divisions, designated as "pedographic", are believed to constitute a unit for land studies more logical than civil or political divisions, since the boundaries of the latter very frequently are contrary to natural boundaries. A key to the land types of Michigan is given.

[Soil Survey Reports, 1931 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1931, Nos. 1, pp. 44, figs. 2, map 1; 2, pp. 68, figs. 2, maps 2; 3, pp. 24, figs. 2, map 1*).—The three surveys of which the reports are here noted were made with the cooperation, respectively, of the University of Nebraska, the [New York] Cornell Experiment Station, and the Maryland Geological Survey and the Maryland Experiment Station.

No. 1. *Soil survey of Dundy County, Nebraska*, E. A. Nieschmidt et al.—Dundy County, in the southwestern corner of Nebraska, possesses an area of 588,800 acres, this area consisting, physiographically, of "parts of two major physiographic regions of Nebraska—a smooth eastwardly sloping plain occupying approximately the eastern third of the county and most of the area south of Republican River in the south-central and southwestern parts and a valley plain which occupies the remainder."

The report lists 25 soil types of 13 series, 24.9 percent of Valentine sand having been the most extensive type found. Keith silt loam, with the inclusion of small slope and deep phases, occupies 14.4 percent of the total area, and 18.5 percent of dune sand constitutes the unclassified material.

No. 2. *Soil survey of Steuben County, New York*, C. S. Pearson et al.—Steuben County, in the south-central section of western New York State, possesses an area of 894,720 acres, a part of the southwestern plateau section of the State, and mainly drained by tributaries of the Susquehanna River.

The soils of Steuben County were found to consist of 29 series inclusive of 55 types, in addition to 0.6 percent of undifferentiated alluvial soils. The most extensive of these types, Lordstown stony silt loam, was found to occupy 23.6 percent of the total area surveyed, and Mardin gravelly silt loam was found to cover 19.8 percent.

No. 3. *Soil survey of Queen Annes County, Maryland*, S. O. Perkins and H. B. Winant.—Queen Annes County consists of 241,280 acres of Atlantic Coastal Plain lands in the Eastern Shore section of Maryland, mostly flat, and lying at 20 ft. or less above sea level. With reference to drainage, the soils of the county are here divided into the three groups of the brown well-drained soils (Sassafras and Keyport series), the light gray poorly drained soils, and the black poorly drained soils.

The classified lands here mapped and described form 4 series and include 14 types, the more extensive of which are the Sassafras loam, silt loam, and sandy loam, 21.8, 18.2, and 10.2 percent, respectively, of the total area surveyed; Keyport silt loam, 13 percent; and Elkton silt loam, of the light gray poorly drained group, 14.3 percent. The unclassified areas include 7.7 percent of meadow and tidal marsh.

Soil survey of the Suisun area, California, E. J. Carpenter and S. W Cosby (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1930, No*

18, pp. 60, pls. 2, figs. 5, map 1).—The Suisun area comprises 352,000 acres of the interior lowland of California (the Sacramento Valley) and contains the level plain of the Sacramento River and an alluvial fan reaching from the foot of the Coast Ranges to the alluvial plain, together with a hilly and mountainous section.

The soils of this area consist of 19 series inclusive of 24 types, of which the most extensive is Montezuma clay adobe, 12.3 percent of the total soil area examined. Marshland, including a tidal phase, occupies 10 percent, muck and peat 2.8 percent, and made land 0.9 percent.

The survey was made in cooperation with the California Experiment Station.

Schuyler County Soils, E. A. NORTON, R. S. SMITH, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 56* (*1934*), *pp. 23, pls. 2, figs. 9*).—Schuyler County, located in west-central Illinois, possesses an area of 273,050 acres, generally very well drained, and consisting, physiographically, of tabular divides between V-shaped valleys. The soils are here listed as 18 types of 17 series. Clinton silt loam occupies 33.03 percent of the total area, an eroded silt loam 32.21 percent, and Huntsville silt loam 11.73 percent.

Some characteristics of mature soils in Michigan, J. O. VEATCH and C. E. MILLAR (*Michigan Sta. Quart. Bul., 16* (*1934*), *No. 4, pp. 295, 296*).—Soil profiles in Michigan are classified on the basis of the presence or absence of argillaceous B horizons, or "brown" or "ortstein" horizons, and of a gray leached horizon below the brown or ortstein horizon. As a means of determining the influence of the age, or time factor, in the development of the chemical and physical peculiarities of the soil profile, old and young dune sands along the shore of Lake Michigan were studied. The soil on the oldest surface was found to exhibit a fairly well marked B horizon, and in comparison with the recently deposited sand, a lower pH, less calcium (lime), higher percentage of colloids, and a higher content of iron as ferric oxide. A comparison of soils on the oldest and youngest land surfaces, underlain by clay, indicated that the soil on the oldest surface has a B horizon colored by ferric oxides, and that calcium and magnesium carbonates have been completely removed to depths of 3 ft. or more.

Field observations and laboratory studies showed that there are mature soils in the northern part of the State characterized by a grayish leached horizon below the brown or "orterde" horizon. Data from some of the chemical studies suggested that the ratio $SiO_2:(Al_2O_3+Fe_2O_3)$ in the B horizons may be rather a continuation of that of the parent material than wholly a result of soil formation processes.

Preliminary study of the profiles of the principal soil types of Wisconsin, C. E. KELLOGG (*Wis. Geol. and Nat. Hist. Survey Bul. 77A* (*1930*), *pp. 112, pls. 6, figs. 11*).—"This investigation was undertaken for the purpose of describing the principal soil profiles in Wisconsin and for determining if a relation exists between the base exchange capacity and the morphology of the soil profile." The principal soil-building process was found to be one of podsolization, varying in intensity under different conditions. A close correlation between the base exchange capacity of the various horizons of the soil profile and the mode of formation of the profile was observed. Base exchange data were shown to be very useful for "giving quantitative expression to profile studies." A similar but much less valuable and striking correlation was found in the case of the clay content.

"That each genetic horizon of a mature soil comes into equilibrium with its environment at a definite ratio of base exchange capacity to clay content is suggested. Weathering of a mature profile leads to a deepening of the soil horizons rather than to a change in the above relationship." The importance

of the soil profile in reference to the relationship between soil and plant is emphasized.

A classification of the soil series according to their relationship to the great soil zones is presented. The soil series were found to fall into the Gray-Brown Forest, Podsol, and Prairie zones, with numerous intrazonal soils lying between the Podsol and Gray-Brown Forest zones.

A survey of the soils of Berkshire, N. H. PIZER (*Univ. Reading Bul. 39 (1931), pp. 141, [pl. 1], figs. [21]*).—Berkshire is described as a small county, its area being 462,200 acres, centrally placed in the southern part of England. Its drainage is provided by the Thames and the southern tributaries of that river. In the survey 24 "formations" were found, those described as upper chalk and London clay occupying 14 and 13 percent of the area, respectively, while a valley loam and valley gravel taken together are credited with a further 10 percent. Other geological information is recorded in some detail, and the soils of the formations above noted are described, their chemical and physical analyses are briefly discussed in each case, and for each some suggestions as to fertilizer treatments are made.

Soil survey, Mandalay Canal area, Burma, J. CHARLTON (*Burma Dept. Agr., Agr. Survey 15 (1932), pp. 52, [pls.] 12*).—An introduction and description of the area surveyed are followed by accounts of the localities sampled, a statement of the physical and chemical data determined, a discussion of these data, a chapter on the typical soil-sanè, a chapter consisting of recommendations for soil treatment, and an appendix containing tabulated information of various sorts.

Soil survey of Sierra Leone, F. J. MARTIN and H. C. DOYNE (*Freetown: Sierra Leone Dept. Agr., 1932, pp. 35, maps 2*).—This report describes the types found, indicating color, texture, and the general regions of their respective occurrence but in their proportional area. The physical make-up of the first 4 ft. of the profile taken in 1-ft. layers is shown in the cases of several of the more extensive soils; and the following general statements are made concerning the chemical nature of the soils:

"Practically all soils are 'light' and easily penetrable by water, except some swamp soils. All soils are more or less acid (pH 4–6). Practically all soils examined are either laterites or lateritic. (Silica : alumina ratio of clay less than 2.0). All soils have a definite lime requirement (generally from 0.2 to 0.3 percent). The organic matter varies usually from 2.0 to 4.0, and about 42 percent of this is humified. In general, the nitrogen figures vary in proportion to the organic matter content. There is a deficiency of potash in most soils (0.02 to 0.13 percent K_2O soluble in strong HCl). The phosphorus content varies from 0.07 to 0.19 percent P_2O_5. The exchangeable calcium is low, varying from 0.02 to 0.1 percent."

Osmotic pressure in soil bacterial cells as related to their climatic adaptation capacity [trans. title], E. N. MISHUSTIN (MISCHUSTIN) and M. A. MESSINEVA (MESSINIEW) (*Mikrobiologiîa, 2 (1933), No. 1, pp. 63–71; Ger. abs., p. 71*).—The observations recorded showed that bacterial cells separated from soils of different climatic zones have unlike osmotic pressures. The observed osmotic pressures increased from the moist to the drier regions, the pressure measured in the microbial cells found in the podsolic zone (Moskva (Moscow), Arkhangelsk (Archangel), etc.) not exceeding 4 atmospheres. As the sampling progressed southward the value steadily increased, reaching the maximum figure found—that of from 15 to 17 atm.—only at the southernmost point of observation (Krasnodar). This increase in osmotic pressure is considered a unique adaptation reaction of bacteria subjected to conditions unfavorable with respect to soil moisture content.

The effect of Azotobacter on the yield of the higher plants [trans. title], P. A. GENKEL' (P. HENCKEL) (*Mikrobiologiâ, 2 (1933), No. 1, pp. 81–87; Ger. abs., pp. 86, 87*).—The author carried out pot experiments with a view to investigating the inoculability of wheat seed by pure cultures of *Azotobacter* (species not designated), a transural chernozem soil, described as of a lumpy texture, being used. Concurrently, quantitative *Azotobacter* inoculations of the soil were undertaken, as were also experiments on the effect of combining with the chernozem soil an admixture of the B_2 horizon of a columnar alkali soil, the author having found the last-named soil layer to contain *Azotobacter* in large numbers.

Inoculation either of the seed or of the soil with pure cultures of *Azotobacter* increased the dry-matter grain yield, the seed inoculation bringing about a yield approximately 10 percent greater than that from the uninoculated controls, while soil inoculation added about 2 percent more to the gain. The addition of 50 g per pot of the alkali soil B_2 horizon, rich in *Azotobacter*, caused an increase in the dry-matter grain yield of about 78 percent over that of the control. The total nitrogen content increased with the increasing grain yield. Field experiments with oats resulted in an increase of about 18 percent in total crop yield following inoculations.

Absence or inactivity of Azotobacter in the soil [trans. title], E. DIANOVA and A. VOROSHILOVA (*Mikrobiologiâ, 2 (1933), No. 2, pp. 128–138, fig. 1; Eng. abs., pp. 137, 138*).—By a close comparison of the results yielded by various methods, the authors reached the conclusion that their failure to demonstrate the presence of *Azotobacter* in early fallow soil could not be due to inadequacy of the methods but must indicate the actual absence of *Azotobacter* from this soil. Five years' field work gave the same results with respect to the early fallow soils as did the laboratory work. *Azotobacter* inoculated into limed field soils was still alive after 5 yr., but in unlimed soils the *Azotobacter* numbers were very greatly reduced after 18 mo.

The authors consider also that they have evidence of the existence in soils of an organism morphologically similar to *Azotobacter* but having nothing else in common with it. This last-named organism is believed to have led to errors as to the presence of *Azotobacter* in early fallow and in some other soils.

The specific influence of acidity on the mechanism of nitrogen fixation by Azotobacter, D. BURK, H. LINEWEAVER, and C. K. HORNER (*Jour. Bact., 27 (1934), No. 4, pp. 325–340, figs. 4*).—The authors of this contribution from the Bureau of Chemistry and Soils, U.S.D.A., find the rate of consumption of free nitrogen gas by *Azotobacter* to decrease from a maximum at pH 7.8 to a zero limit at 6.0 (5.97 ±0.02). "The approach is perpendicular (concave downward) and reversible. Irreversible inactivation takes place only below 5.0." The rate of consumption of fixed nitrogen (urea, ammonia, nitrate) decreased from a maximum at pH 7.8 to a considerably more acid, measurable limit at 4.5 or less. The approach was found asymptotic (concave upward) and to be entirely reversible above 4.5. The rate of oxygen consumption as a function of pH was similar in type.

"The limiting pH value 6.0 for fixation is a characteristic constant. No factors are known capable of altering this limit; in particular, calcium or strontium concentration and nitrogen pressure, three factors like pH which specifically influence fixation as distinguished from growth or respiration, fail to do so. The Michaelis constant of fixation, $Km_{N_2}=0.22$ atmosphere, or the pressure at half maximum velocity, is independent of pH, and calcium or strontium concentration. Inhibition of fixation by H ion and oxalate is noncompetitive."

The nitrogen fixing enzyme system is termed "azotase." Its known properties are described. The particular enzyme of the system which combines directly with free nitrogen is termed "nitrogenase."

Longevity of Azotobacter in soils treated with lime and superphosphate, S. C. VANDECAVEYE and S. ANDERSON (*Jour. Amer. Soc. Agron., 26, (1934), No. 5, pp. 353–364*).—A study of the effect in 24 soil types of normal field applications of lime and superphosphate on the longevity of *Azotobacter* is reported in a contribution from the Washington Experiment Station.

Preliminary examination of the samples showed that 15 of the 16 soils received direct from the field and not kept in storage contained active *Azotobacter*, but in the majority of cases the number of these bacteria present was small—regardless of the soil reaction, which in 9 samples represented pH values ranging between 4.7 and 6.0.

Untreated and superphosphate-treated soils having a pH value of 6 or less failed to support appreciable *Azotobacter* development following inoculation with a mixed culture of different strains of these bacteria which introduced approximately 1,000 organisms per gram of dry soil. The same soils were better able to support *Azotobacter* growth when lime had been added either alone or in combination with superphosphate. They still contained these bacteria 14 mo. after inoculation. *Azotobacter* development was not appreciably benefited from normal field applications of superphosphate applied either alone or in combination with lime, nor did it respond materially to further additions of phosphate salts as used in the soil plaque test. "The results of the experiments indicate that although applications of lime sufficient to change the reaction of acid soils to a pH value above 6 may promote the longevity of *Azotobacter*, other factors than reaction must be considered before successful inoculation can be expected. It seems that a suitable soil medium in addition to an adequate supply of appropriate carbohydrates and essential mineral nutrients is necessary to establish a sufficiently permanent and active *Azotobacter* flora in the soil to fix measurable quantities of atmospheric nitrogen under field conditions." Data indicating that "under field conditions there is a great fluctuation in numbers of *Azotobacter* during different times of the year in a soil considered well adapted for the development of these bacteria" are also presented.

On nitrous products in cultures of Azotobacter chroococcum and its relations with other soil micro-organisms [trans. title], D. M. NOVOGRUDSKIĬ (NOVOGRUDSKY) (*Mikrobiologiîa, 2 (1933), No. 3, pp. 237–250; Eng. abs., pp. 249, 250*).—A number of bacteria (*Bacillus denitrofluorescens, B. mycoides, B. mesentericus*), requiring fixed nitrogen for their development, were found capable of reproduction on media containing no nitrogen if cultivated together with *A. chroococcum*. Bacteria for which proteins are believed to constitute the only possible source of nitrogen (*B. mycoides, B. subtilis*) were able to reproduce only on old cultures of the *Azotobacter*. Bacteria capable of assimilating not only proteins but also amino acids and ammoniacal compounds (*B. denitrofluorescens, B. mesentericus*) were able to reproduce both in young and in old cultures of the *Azotobacter*. The rate of reproduction of the bacteria investigated when these were cultivated jointly with the *Azotobacter* appeared to be determined by the forms of nitrogen which they require for their reproduction, and was not the same in young cultures as in older growths.

It is concluded that the *Azotobacter* species in question produces ammoniacal-nitrogen compounds in the younger cultures, and in the later stages, after nitrogen fixation has ceased, protein substances. As neither type of nitrogen compound could be detected in pure cultures of *Azotobacter*, it is con-

sidered that these substances must be formed, at any one time, in very minute quantities which, in the presence of the concomitant organism, are immediately utilized.

The relations of Bacillus mycoides with ammonification, nitrification, and soil fertility, M. Tyagny-Ryadno (*Jour. Agr. Sci. [England], 23 (1933), No. 3, pp. 335–358, figs. 7*).—*B. mycoides* was found to be an organism capable of an energetic decomposition of organic nitrogenous matter with an abundant production of ammonia. When soil was inoculated with a culture of this organism, active ammonification took place and the rate of nitrification was increased. The first effects of the inoculation of soil with *B. mycoides* were a parallel development of ammonification and nitrification; later the rate of ammonification fell off, but nitrifying organisms continued to transform ammonia into nitrate. The degree of nitrification in chernozem soils was found to be a function of the activity of *B. mycoides*. By creating conditions appropriate to this organism, both ammonifying and nitrifying processes were also stimulated.

Manuring was found to be beneficial "not solely on account of the nutrients supplied ad hoc, but also because it leads to an increase in the numbers of *B. mycoides*. Farmyard manure is a source of *B. mycoides*, and acts similarly to an inoculation with those bacteria." Phosphate rock added to the soil stimulated ammonification and nitrification. "These processes in turn produce acid, which assists in making the soil's phosphate reserves available to crop plants." Small quantities (0.3–0.5 ton per hectare) of phosphate rock, together with 5 or 6 tons of farmyard manure per hectare, "by intensifying ammonification and nitrification, have led to considerable increases in the yields of grain and of leguminous crops, and are the most rational manurial dressings for most of the regions of the U.S.S.R."

Physiological studies on Rhizobium.—I, The effect of nitrogen source on oxygen consumption by *Rhizobium leguminosarum* Frank, R. H. Walker, D. A. Anderson, and P. E. Brown (*Soil Sci., 37 (1934), No. 5, pp. 387–401, pl. 1, figs. 3*).—The effects of a variety of sources of nitrogen upon the growth of *R. leguminosarum* at various concentrations of these compounds in the medium were measured, in the work recorded in this contribution from the Iowa Experiment Station, by means of micromanometer respiration chambers. Without nitrogen the organisms continued to respire at a low uniform rate throughout the various tests, presumably in the resting state and with no evidence of growth appearing in the cultures. In a medium similar except in that nitrogen was added in the form of yeast extract, the growth of *Rhizobium* was stimulated almost in direct proportion to the quantity of the extract added. The rate of oxygen consumption increased during the first 12 hr., after which it remained constant or decreased slightly. "Presumably after the organisms had utilized all of the nitrogen in the culture, or after they had passed the logarithmic phase of growth, they were in the resting state, and no growth occurred." In media containing nitrogen added in the form of ammonium chloride, sodium nitrate, urea, or alanine, there was no marked stimulation of growth irrespective of the concentration of nitrogen in the medium, and the cells apparently remained in the resting state throughout the experiment. There was some indication that oxygen consumption by the organisms was depressed by ammonium chloride; and also by the urea in the higher concentrations employed.

"Whether the stimulation of growth induced by the yeast extract was due to its nitrogen content or to some other constituent of the extract is not known. It is entirely possible that the particular form or combination of nitrogen in the yeast extract is especially suitable for use by *Rhizobium*. It

is also possible, however, that the stimulation of growth was induced by energy furnishing material, accessory food constituents, or certain elements necessary for the growth of the organisms which were not supplied in the basic medium."

On the course of nitrification process in alkali soils [trans. title], E. M. DANINI (DAGNINI) and V. A. KOSMORTOV (W. A. KOSMORTOW) (*Mikrobiologiia, 2 (1933), No. 1, pp. 88–91, fig. 1; Ger. abs., p. 91*).—Nitrification in "alkali" (saline) soils which had never been cultivated was found to be confined to the A horizon, regardless of the depth of this layer. The same observation held true both in the case of a crusty alkali soil with an A layer only from 5 to 6 cm thick and in that of a deep columnar alkali soil of a thickness of from 16 to 17 cm. Nitrification could in neither case be detected in the B layer. This limitation of the nitrification process to the A horizon is believed to be due to the physical state of the B_1 horizon if self-conditioned by an inadequate aeration.

Nitrification was found to proceed more actively in the alkali soil than in chernozem soil, and was most vigorous in a crusty columnar alkali soil.

Increases or decreases of the moisture content of the soil amounting to 50 percent of the water-holding capacity caused sharp drops in the nitrifying activity.

The part played by micro-organisms in the process of humus formation [trans. title], A. B. SOROKINA (A. V. SOROKINE) and M. G. TIAGNY-RIADNO (TJAGNI-RJADNO) (*Mikrobiologiia, 2 (1933), No. 3, pp. 285–291; Eng. abs., pp. 290, 291*).—The process of the formation of humus from dead tissue of *Aspergillus niger* was investigated, the experiments being conducted (1) in the Czapek liquid medium but with a diminished nitrogen and carbon content; (2) on an artificial soil formed of sand 67 percent, kaolin 18, chalk 2, and dead fungus (*A. niger*) 13 percent; (3) on a natural soil, Tashkent gray earth containing little organic matter; and (4) upon a compost obtained from the mycelium of *A. niger*. The authors inoculated these media with *Actinomyces flavus*, an accumulative culture of cellulose destroying bacteria, *Bacillus mycoides*, *Aspergillus niger*, and a suspension of natural soil. These inoculating agents were used individually and in various combinations. The influence of the reaction of the medium between the pH values 8 and 5 and that of certain fertilizers was also investigated.

The authors find that dead micro-organisms can undergo transformation into humus. Further, according to the authors' English summary, "*A. niger* possesses a great capacity of producing a synthesis of the α- and β-fractions of the soil organic matter from dead bodies of their own species. The cellulose-destroying bacteria, *Actinomyces flavus* and *B. mycoides*, have a great capacity for mineralizing the α-fraction in the humification of the fungus mycelium. In the case of infection with the soil suspension a particularly active formation of humus at the expense of the dead mycelium of the fungus was observed. An alkaline reaction of the medium heightens the mineralizing capacity of the micro-organisms studied, whilst an acid one, on the contrary, increases their synthetizing activity. Fertilizers ($CaCN_2$ and superphosphate) have no influence upon the formation of humus, but they contribute to its mineralization by the micro-organisms. The most active formation of humus at the expense of the dead body of the fungus is observed in gray earth. In the artificial soil mentioned above the formation of humus is less intense than in gray earth, and under pH 8 the α-fraction is entirely mineralized. On Czapek's liquid medium, though the dead mycelium of the fungus is entirely mineralized, there is no accumulation of humus at all."

Preservation of soils against degeneration, W. L. POWERS (*Soil Sci., 37 (1934), No. 5, pp. 333–341*).—The author of this contribution from the Oregon Experiment Station reports upon a study of certain chemical characteristics of soil samples collected from some of the oldest experimental plats of Oregon and of the States of Ohio, Illinois, and Missouri. The long-continued use of manure, crop rotation with legumes, or liming in the case of acid soils was found to be associated with a definite increase in total nitrogen, soil organic matter, and exchangeable base content.

The experiments recorded "indicate that the constructive humus building soil treatments, the employment of which in long-time field experiments has been associated with maintenance of good crop yields, have also resulted in increases in soil nitrogen, organic matter, and base-exchange content. Fertilizers, where helpful to growth, have assisted in this humus building process. Livestock farming may aid maintenance of organic matter, whereas cultivation or uncontrolled grazing may lead to physical deterioration or increased erosion. The tendency for soil to deteriorate is most marked in humid climates where liming and perhaps mineral fertilizers may be necessary for success with legumes in crop rotation. Further indications are that soil building along these lines is more readily accomplished in calcareous arid or semiarid irrigated soil of medium texture and in a fairly cool climate."

Soil erosion, T. EDEN (*[Gt. Brit.] Imp. Bur. Soil Sci., Tech. Commun. 28 (1933), pp. 30*).—The contents of this bulletin comprise an introduction, sections on extent of damage due to erosion, types of erosian, erosion and rainfall distribution, measurement of run-off and erosion, interaction of soil type and condition with erosion, soil properties conducive to erosion, loss of nutrients caused by it, preventive measures, and a program of soil erosion investigations, and a selected reference list.

The paper "aims at presenting in a concise form modern knowledge of the extent of soil erosion damage, its underlying causes, and methods of prevention. . . . The question of prevention is dealt with in general terms. Local circumstances must inevitably guide technicians and agriculturists in their choice of specific remedies, especially in the selection of crops and rotation."

The soil erosion problem in New Jersey, L. L. LEE (*Jour. Amer. Soc. Agron., 25 (1933), No. 10, pp. 652–660, figs. 4*).—The author of this contribution from the New Jersey Experiment Stations finds that erosion is in almost all parts of New Jersey a menace of which the seriousness has not hitherto been recognized.

In the Appalachian Valley the practice of rotation "has materially assisted in controlling erosion, but most of the land is rolling and therefore erodes badly when cultivated to corn. Gulley and sheet erosion are therefore common especially on the Dutchess soils." In the Highlands section much of the land remains wooded and is thereby protected from erosion, but where the less sloping areas have been cleared for general farm crops "gulley and sheet erosion is serious but would be much more so were not crop rotation the general practice. In the valleys the Washington, Hagerstown, Dover, and Hoosic soils predominate, and erosion is severe on slopes of 2 percent or more." In the Piedmont plain section "general farm crops are grown in rotation, but sheet and gulley erosion is most severe and widespread. Fully 80 percent of the cleared area of the Penn and Lansdale soils are suffering from sheet erosion, resulting in the loss of vast quantities of surface soil, and in many places the subsoil is exposed. In many other places sheet and gulley erosion are so severe that bedrock is exposed over extensive areas either on the surface or 2 or 3 in.

below." In the Coastal Plain setion the eastern three-fifths, or light sandy belt, is so nearly level and carries so much forest cover as to be free from serious erosion; but "the heavy Coastal Plain Belt . . . is almost entirely cleared of its virgin timber and utilized largely in the intensive production of potatoes, fruit, corn, and vegetable crops. Such a cropping system does not lend itself to rotation. Generally, the topography is quite level to gently sloping and locally rolling. The soils of the Sassafras and Collington series predominate and occur for the most part as loams and sandy loams. In this belt sheet and gulley erosion are depleting vast areas of the surface soil. There is scarcely any cultivated sloping land upon which the subsoil is not exposed, and erosion is very serious even on slopes of less than 1 percent."

Of the situation in general, the author states that "it is of the utmost importance that remedial measures be taken without delay in order to avoid further damage and prevent an already serious soil condition from becoming even more difficult to control."

Denudation and soil erosion in Nyasaland, A. J. W. Hornby (*Nyasaland Dept. Agr. Bul. 11 (1934), pp. 32, [fig. 1]*).—The local practice of native farmers in preparing forested areas or brush land for cropping by cutting and burning the natural cover is regarded as one of the most serious causes of the increased rate of erosion, both because of the extensive deforestation directly involved and because the short period (about 2 yr.) of productivity of land thus treated has resulted in the clearing and use of hill lands of which the slope is so sharp as to add still more to the erosion tendency.

Part 1 of the bulletin discusses this and other causes of excessive erosion, and certain of its effects, under the heads of comparative effects of denudation and abnormal soil erosion in other countries, past and present state of Nyasaland—outstanding changes during the historical period, factors influencing the degree of erosion in Nyasaland, methods of native farmers in Nyasaland, alleviation of conditions due to erosion, and changes in climate with denudation. Part 2, on special measures and remedies, briefly considers the local practicability and effectiveness of such preventive means as storm-water drains, ridges on the contour, strip cropping, ridge terraces, bench terraces, cover crops, minor drainage systems, silt pits, use of stone walls and revetting, and dams at the headwaters of streams and in gullies.

Summer-fallow, L. Moomaw and T. E. Stoa (*North Dakota Sta. Circ. 54 (1934), pp. 8, figs. 4*).—On the basis of work at the Dickinson Substation and elsewhere, the authors find that an efficient summer-fallow tillage conserves the water supply (1) by so preparing the soil surface as to insure the penetration and the maximum absorption of the rainfall, (2) by an early and effective destruction of weeds which otherwise would use much of the soil water, and (3) by "leaving the surface soil with a coarse, granular, cloddy mulch to protect against evaporation, soil crusting, and soil blowing." Methods and precautions are discussed, including a comparison of plowed and plowless fallows and summer fallow substitutes.

Crop yields from Illinois soil experiment fields in 1933, together with a general summary for the four-year period ending in 1933, F. C. Bauer (*Illinois Sta. Bul. 402 (1934), pp. 37–92, figs. 2*).—In addition to the continuation of the report on the long-continued field experiments (E.S.R., 71, p. 16), the present bulletin contains, as part 1, "rotation summaries", a collective summary of the work of the 4-year period ending in 1933. Part 2 consists of the individual field reports. An index of the fertilizer and other treatment materials is appended.

The effect of the contact of chemical fertilizers with seeds on their germination, V. G. Gokhale and P. M. Gaywala (*Agr. and Livestock in

India, 3 (1933), No. 3, pp. 256–263).—Field tests with ammonium sulfate applied at the rate of 20 lb. to the acre and in various degrees of proximity to the seed are reported upon, together with the moisture contents of the soil plats used. The effect of the salt varied with the kind of seed as well as with the length of the period of contact and the closeness of contact. The seed of a cotton species, *Gossypium neglectum*, placed in direct contact with ammonium sulfate showed only about 6 percent of the germination shown by a trial planting. Other species tested were *Pennisetum typhoideum* and *Andropogon sorghum*.

Acidity and alkalinity produced by changes in the nitrogen, sulphur, and carbon cycles, J. P. Conrad (*Plant Physiol., 8 (1933), No. 4, pp. 509–524, figs. 4*).—The author of this contribution from the University of California finds, from an analysis of previously recorded data and of certain theoretical considerations, that "transformations from one form of nitrogen to another within the group N_2, urea, NH_4NO_3, NH_4NO_2, and proteins cause very little or no change in titratable acidity or alkalinity. Transformations from any one or all of this group to ammonia cause the appearance of about one equivalent of titratable alkalinity for each gram atom of nitrogen changed. Transformations from this same group to nitric acid or nitrates result in the production of about one equivalent of titratable acidity for each gram atom of nitrogen changed. When weak acids and bases are formed, the pH of the medium is important in determining the amount of titratable acidity and alkalinity produced. This is especially true in some of the transformations that may take place in the sulfur and carbon cycles."

Charts showing certain of these relationships are given.

Physiological acidity and alkalinity of inorganic nitrogenous compounds in solution cultures, J. P. Conrad (*Jour. Amer. Soc. Agron., 26 (1934), No. 5, pp. 364–372*).—The experimental procedure described in this contribution from the California Experiment Station included complete utilization of the nitrogen in the single salt solutions by the sorghum and maize seedlings used. Simultaneous comparisons were made between parallel solution cultures. Typical comparisons included NH_4Cl vs. HCl, $NaNO_3$ vs. $NaHCO_3$, and others. The titratable acidity of the solutions before and after absorption and the pH values of the dried and ground plants after absorption were determined.

"Parallel cultures of $(NH_4)_2SO_4$ vs. H_2SO_4 and of NH_4Cl vs. HCl gave residual titratable acidity in each case after the disappearance of the NH_4 ions from the cultural solutions. The residual liquids from the ammonium salts showed a greater amount of acidity than did those where the acid was supplied chemically. The pH determinations of the ground material showed that the acids absorbed or physiologically formed within the plants were still in evidence. Parallel cultures of $NaNO_3$ vs. $NaHCO_3$ and KNO_3 vs. $KHCO_3$ gave residual titratable alkalinity in each case after the disappearance of NO_3 ions from the cultural solutions. The residual liquids from the nitrate salts gave smaller amounts of alkalinity in each comparison. The alkalinity absorbed or physiologically formed in each case was clearly shown as still present by the pH determinations of the ground plants. Parallel cultures in solutions of HNO_3, NH_4NO_3, NH_4HCO_3, and H_2O after absorption of all NH_4 and NO_3 ions gave small amounts of titratable alkalinity in each case. These titration values were practically equal to each other, although the original solutions of HNO_3 had had marked titratable acidity and those of NH_4HCO_3 marked titratable alkalinity. The pH values determined on the plants from the nitrogen compounds furnished in this group were practically equal to those on the plants grown in water. This showed that the acidity and alkalinity absorbed by plants in this group had largely disappeared in the transformations following

absorption. These findings are in accord with theories previously proposed" (see above).

The influence of the hydrogen-ion concentration of the culture solution upon the absorption and assimilation of nitrate and ammonium nitrogen by peach trees grown in sand cultures, O. W. Davidson and J. W. Shive (*Soil Sci., 37 (1934), No. 5, pp. 357–385, pls. 2, figs. 5*).—In the experiments discussed in the present contribution from the New Jersey Experiment Stations peach trees were grown in two series of sand cultures, in one of which the cultures received nitrogen only in the ammonium form, in the other only in the nitrate form. The nutrient solutions in each series of treatments were applied at pH 4, 6, and 8. Absorption tests were conducted to determine the rates, in milligrams per gram of dry plant material per hour, at which nitrogen was absorbed by the plants. Quantitative determinations of the relative distribution of various nitrogenous fractions in the plants grown in the treatments were made. The more important results may be summarized briefly as follows:

The trees made much better growth in the cultures with ammonium as the sole source of nitrogen when supplied continuously with a culture solution at pH 6 than when grown at pH 4 or 8; but made, under like experimental conditions, much better growth at pH 4 than at pH 6 or 8 with nitrate as the sole source of nitrogen. The trees grew about equally well at pH 6 with ammonium as the source of nitrogen and at pH 4 with nitrate as the source of nitrogen. Ammonium nitrogen was absorbed at higher rates by trees supplied with solutions adjusted to pH 6 than by those supplied with solutions adjusted to pH 4. Nitrate nitrogen was always absorbed at higher rates by trees supplied with solutions adjusted to pH 4 than by those supplied with solutions adjusted to pH 6 or 8. At favorable pH values of the culture solutions, peach trees absorbed nitrogen at relatively higher rates when it was supplied in the ammonium form than when it was supplied in the nitrate form.

The initial stages of ammonium assimilation by these trees took place in the roots. Nitrate reduction by peach trees took place almost entirely in the roots. Good growth and high yields of plant substance were usually associated with relatively low percentages of protein nitrogen, both in stems and in roots. Good growth and high yields of plant substance were associated with relatively high percentages of amide, amino, and humin nitrogenous fractions. The stems of trees that made the best growth and produced the highest yields of plant substance were always relatively low in basic nitrogen, while the roots of the same plants were relatively high in this fraction.

Some chemical and biological effects of cyanamid and certain other nitrogenous fertilizers on various Iowa soils, M. H. Brown (*Jour. Amer. Soc. Agron., 26 (1934), No. 5, pp. 442–450*).—In the experiments reported upon in this contribution from the Iowa State College, applications of cyanamide and sodium nitrate increased the pH of the soil, while ammonium sulfate and a commercial ammonium phosphate preparation caused a decrease when these materials were applied in amounts equivalent to 21 and 63 lb. of nitrogen per acre, respectively. Applications of cyanamide caused a marked increase in the soluble phosphorus content of the soil. Sodium nitrate and ammonium sulfate applied in quantities equivalent in nitrogen content had no effect. Application of cyanamide, sodium nitrate, ammonium sulfate, and of the ammonium phosphate preparation exerted no marked effect on the nitrate accumulation in the soil, on the number of molds and bacteria present, on the ammonifying power of the soil, or on the nitrifying power of the soil. Applications of superphosphate, however, brought about some increase in biological activity.

It was also observed that "the number of molds in soil had no marked effect on the amount of ammonia produced from dried blood in ammonification tests. The amounts produced were not affected by marked changes in numbers of bacteria."

The phosphate of southern California soils in relation to citrus fertilization, H. D. CHAPMAN (*California Sta. Bul. 571 (1934), pp. 22, figs. 3*).—Chemical investigation and pot tests concurred in indicating a good supply of phosphate in most of the unfertilized soils of the main citrus areas of the State. The phosphate was, further, found readily available except in cases of the calcareous types. In fertilized citrus orchards substantial phosphate gains and a solubility of the phosphate greater than that observed in unfertilized soils were found. No significant fruit gains were obtained in the phosphate fertilizer experiments included in 9 field trials covering periods of from 5 to 20 yr., though soil analyses showed the penetration of the phosphate to the root zone. The belief that the citrus trees studied may be able to secure all needed phosphorus from forms less available and total supplies less abundant than are needed by annual crops is expressed. For this reason "it is possible that cover crops, when grown in citrus orchards that are located on calcareous types of soil or on those relatively low in phosphate, will be benefited by applications of phosphate. In cases where satisfactory growth of cover crops has not been obtained, tests with phosphate should be made."

Phosphate fixation and penetration in soils, A. F. HECK (*Soil Sci., 37 (1934), No. 5, pp. 343–355, figs. 4*).—The experiments reported upon in this contribution from the Wisconsin Experiment Station were made upon four distinct soils "in an attempt to ascertain more definitely the nature of the compounds formed and the depth of penetration" when a soluble phosphate is applied to the soil. The probable nature of the fixed phosphates was determined by means of comparing the solubilities in 0.002 N sulfuric acid of known phosphates with those of the phosphates formed in soils through fixation.

"If the ratio of active calcium to active iron and aluminum is high, the fixation will be largely in the calcium form and the fixed phosphorus will be readily available. If the reverse is true, the fixation will be largely as the iron and aluminum compounds of phosphorus, which are difficultly available. On the basis of solubility, the soluble phosphate was fixed in the Miami silt loam largely as calcium phosphate. In the Carrington silt loam, which was more acid, less calcium phosphate and more iron and aluminum phosphates were formed. In the two Hawaiian laterites, the fixation was largely as the basic forms of iron and aluminum phosphates. Although the reaction and the presence of reactive calcium are important factors governing the forms of the fixed phosphorus, in the laterites these factors were overshadowed by the presence of very large quantities of the hydrated oxides of iron and aluminum."

The greatest phosphate penetration occurred in soils which showed a neutral to slightly acid reaction and contained little active iron or aluminum. Either active calcium, iron, or aluminum inhibited the downward movement of phosphorus in soils in proportion to the quantities of these elements present and in an inverse proportionality to the solubilities of their phosphatic compounds. Of the soils studied, the slightly acid Miami silt loam, with little active iron or aluminum, gave maximum penetration, whereas the laterites, with large amounts of active iron and aluminum, allowed very little penetration, the phosphorus being fixed and held largely in difficultly available forms within a few millimeters of the point of application.

The availability and downward movement of rock phosphate in Illinois soils when used liberally for 25 to 30 years and influence of the treatment on available potash and total nitrogen, A. U. THOR (*Jour. Amer. Soc.

Agron., *25* (*1933*), *No. 10*, *pp. 661–674*).—The author of this contribution from the Wisconsin Experiment Station made a study of the availability and downward movement of phosphorus in the soils of three Illinois Corn Belt farms to which liberal amounts of rock phosphate had been applied from 25 to 30 yr. In all three cases rock phosphate has given satisfactory results. Surface, subsurface, and subsoil samples were secured in 1931 from phosphated and unphosphated areas of these farms. These samples were tested for total phosphorus and for that soluble in 0.002 N sulfuric acid, for replaceable calcium and magnesium, soil acidity, available potash, and total nitrogen.

The concentrations of soluble phosphorus on the three farms were found to have been increased by 370, 217, and 224 lb. per acre, respectively, through the addition of rock phosphate.

The downward movement of phosphorus into the subsurface was evident on all three farms, but more so in the open-textured soils, "where there was an appreciable movement into the 8- to 16- and 16- to 24-in. depths. On the more compact soil there was a definite movement into the 7- to 14-in. depth but only a slight movement into the 14- to 21-in. depth. It is believed that the phosphorus has been carried downward largely mechanically by gravitational water. The decay of the roots of the deep-rooted legumes, alfalfa, and sweetclover, no doubt, has also increased the amounts of soluble phosphorus in the subsurface and subsoil, although the apparent importance of this factor in the downward translocation of essential fertilizer elements is lessened when the data for available potassium and total nitrogen are studied in this connection. . . . The favorable pH range of 6.0 to 7.0 of the limed and phosphated soils on these farms no doubt has had a direct bearing upon the amounts of available phosphorus present and the good crop yields obtained. . . .

"The use of lime and rock phosphate with the growing of legumes regularly in the rotation has apparently increased the amounts of available potash and total nitrogen in the surface soil" of two of the farms, although on the third "this relationship has apparently been masked by the large amounts naturally present and the inherent irregularities in the soil."

The influence of magnesium deficiency on phosphate absorption by soybeans, L. G. Willis, J. R. Piland, and R. L. Gay (*Jour. Amer. Soc. Agron.*, *26* (*1934*), *No. 5*, *pp. 419–422*).—The Durham and Norfolk sandy loams occurring in North Carolina "are in many instances so deficient in magnesium as to require fertilization with some magnesium compound, and the deficiency is almost invariably accentuated by the application of nonmagnesian lime." Areas of these two soils were included in experiments made in an attempt to find the relation, if any, between magnesium and the absorption of phosphates by plants.

Calcium and magnesium showed themselves about equally effective as agents in the absorption of phosphates by soybean plants. "With an abundance of calcium a deficiency of magnesium does not limit the absorption of phosphates. The data do not indicate whether the phosphate absorbed under these conditions is efficiently utilized, but collateral evidence indicates that magnesium deficiency and phosphate deficiency have no mutual relation."

Absorption of potassium by plants as affected by decreased exchangeable potassium in the soil, E. L. Proebsting (*Jour. Pomol. and Hort. Sci.*, *11* (*1933*), *No. 3*, *pp. 199–204*, [*pls. 2*]).—Experiments at the Long Ashton Research Station, University of Bristol, on orchard soils from which a large proportion of the colloids had been removed were made with buckwheat followed by tomatoes, nutrients having been added to some of the treated soils.

The results indicated a wide variation in the ability of plants to obtain their potassium supply from a given soil. It appeared also that neither exchange-

able potassium nor water soluble potassium indicated curtailed ability of the soil to supply potassium to plants, the nonexchangeable potassium being apparently an important source of this element for some plants and in some soils.

Investigation of the lime requirements of soils by laboratory methods and by fertilizer experiments [trans. title], edited by O. LEMMERMANN (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., Sup. 2 (1933), pp. 463*).—Continuing an earlier publication (E.S.R., 69, p. 14), reports on field and laboratory trials are reported from the National Biological Institute for Agriculture and Silviculture at Berlin-Dahlem, by E. Pfeil; from the Institute for Agricultural Chemistry and Bacteriology of the Berlin-Dahlem School of Agriculture, by O. Lemmermann and L. Fresenius; from the Agricultural Experiment Station of the Agricultural Committee at Bonn, by G. Hager and W. Stollenwerk; from the Institute for Chemistry of the School of Agriculture at Bonn-Poppelsdorf, by H. Kappen; from the Braunschweig (Brunswick) Agricultural Experiment Station, by A. Gehring and Wehrmann; from the Prussian Peat Experiment Station at Bremen, by F. Brüne and T. Arnd; from the Agricultural, Experimental, and Investigational Institute of Breslau, by D. Meyer and C. Krannich; from the Agricultural Experiment Station at Darmstadt, by H. Rössler and L. Schmitt; from the Agricultural Chemical Laboratory of the University of Jena, by H. Immendorff and H. Siemens; from the Agricultural Experiment Station at Königsberg, by S. Goy; from the Agricultural Chemical Institute of the University of Königsberg, by W. Zielstorff and K. Nehring; from the Institute for Soil Science and Plant Nutrition of the State Agricultural Experiment and Investigational Institute of Landsberg, by A. Densch and K. Steinfatt; from the Lübeck Experiment Station, by Steyer and Naumann; from the Münster Agricultural Experiment Station, by A. Bömer, R. Balks, and P. Rintelen; from the Experimental and Control Station of Oldenburg, by J. Contzen and F. Nieschlag; and from the Technological School of München, by H. Niklas and A. Hock.

Adaptability and accuracy of the Emerson lime analyzer for testing the neutralizing value of various liming materials in Virginia, N. A. PETTINGER and R. L. SELBY (*Jour. Amer. Soc. Agron., 26 (1934), No. 3, pp. 240–248*).—The equipment named was found to be "not suitable for testing the fluffy limes, such as burnt, hydrated, and air-slaked, because the hydrometer pan supplied by the manufacturer is too small to receive the required amount of material in weighing out the sample for testing;" but the use of a larger weighing pan, with the necessary compensating modifications, permitted the extension of the test to the lighter materials. In tests of the accuracy of the estimation as compared with that obtainable by the tentative method of the Association of Official Agricultural Chemists, "the values obtained by the two methods differed by less than 1 percent $CaCO_3$ equivalent in 64 percent of the total number of samples tested, by less than 2 percent $CaCO_3$ equivalent in 86 percent of the tests, by less than 3 percent $CaCO_3$ equivalent in 93 percent of the tests, and by less than 4 percent $CaCO_3$ equivalent in all of the tests. . . .

"Since a deficiency of 10 percent in value is allowable by the agricultural lime law in Virginia, it is concluded that the Emerson analyzer is well within the limit of accuracy required for testing liming materials in this State."

Liming New Hampshire farm lands, F. S. PRINCE and P. T. BLOOD (*New Hampshire Sta. Circ. 44 (1934), pp. 12, figs. 2*).—Lime has been shown to benefit practically all crops grown on New Hampshire dairy farms not only by neutralizing acidity but by promoting those bacterial activities which increase the availability of the plant food of the soil and of manure, and by increasing the effectiveness of fertilizers—lessening the fixation of phosphate, increasing

potassium availability, etc. "Crops which have responded generously to lime applications include corn, oats, timothy, alsike and red clover, soybeans, alfalfa, and sweetclover."

The results of a number of liming experiments carried out on farms in various parts of New Hampshire and with various crops are recorded. On a soil showing the initial pH value 4.8, at Greenland, 2 tons per acre of a magnesian limestone increased the yield of soybean hay by 1,142 lb. per acre as against a gain of only 897 lb. per acre from 2-ton applications of calcic limestone. "The indications are . . . that at that degree of acidity magnesium is likely to be a limiting factor in crop production. This deficiency can be met with magnesium limestone on highly acid soils, with a fertilizer containing magnesium in its formula, or by using magnesium sulfate (Epsom salts)." The better economy of applying the magnesium as magnesian limestone wherever any liming is required is pointed out, however.

AGRICULTURAL BOTANY

Synthesis of proteins in plants.—I, Conversion of nitrates into protein in Helianthus annuus, Linn., K. S. VARADACHAR (*Jour. Indian Inst. Sci., 16A (1933), No. 12, pp. 129–138, figs. 2*).—A direct method of feeding plants is described, which involves injection of nutrient solutions, through a needle-pointed capillary glass tube with its point inserted into the vascular system of the plant, as close to the ground as possible. This technic was applied to the study of protein synthesis. Nitrogen-starved sunflower plants were given potassium nitrate solution, and the resulting chemical changes in the plant were followed. Dry weight increase was promoted by this feeding. The total nitrogen in the plant increased with feeding, but not in direct proportion to the potassium nitrate solution, and the amount of humin nitrogen in the plant behaved in an erratic fashion. Values for amide nitrogen were low (0.01–0.1 percent of dry weight) and variable.

The results suggest that there is a continuous conversion of nitrate into other forms of nitrogen, and that it passes through the amide stage before being converted into protein.

Sand and water culture studies on the effect of the copper ion [trans. title], K. SCHARRER and W. SCHROPP (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 32 (1933), No. 3–4, A, pp. 184–200, figs. 3*).—Copper sulfate (10^{-6} to 10^{-1} milli-equivalents) was applied to wheat, rye, barley, oats, corn, and peas. Yields of wheat were less than control throughout and rye less in all but 10^{-3} and 10^{-2}. Barley was equal to or above the control in all amounts up to 10^{-1}. Oats were erratic. Corn showed appreciable increases up to 10^{-1}, and peas in many cases up to 10^{-2}. One and 10 m.e. were definitely injurious to all crops. Calcium nitrate exerted an antagonistic action to copper injury. A bibliography of 88 references is included.—(*Courtesy Biol. Abs.*)

Dew formation and its physiological effect on the plant [trans. title], F. ZATTLER (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz, 10 (1932), No. 3–5, pp. 73–89, figs. 5*).—Plants of hops and hemp were grown in containers to which increasing amounts of fertilizer were added. These were arranged in parallel rows and sprinkled each morning with distilled water. The absorption of pure, salt-free water by the portions of the plants above ground has the possibility of mitigating the effect of the absorption of a solution of a too high salt concentration by the roots. Thus with increasing fertilization the sprinkled plants showed better growth, as indicated by elongation, than the unsprinkled plants.

The favorable effect of sprinkling is evident in hops, even in the early stages of growth the following spring. With heavily fertilized pistillate hemp plants, sprinkling increased the weight of the harvested seed 26.6 percent. In spite of the greater height, the weight of the tops and roots was reduced 11.3 and 26.9 percent, respectively. Sufficient dew seems to be absorbed to modify the products of assimilation so as to promote flowering and fruiting at the expense of vegetative development. From these and other observations (on leaf development, etc.), it follows that the absorption of water by the portion of a plant above ground may modify in many ways structure and form. Herewith, the degree of sensitivity of the plant to salt concentration plays an important role, which may be shown in comparative experiments with mustard, oats, buckwheat, and the two Cannabineae.—(*Courtesy Biol. Abs.*)

Rings of cork in the wood of herbaceous perennials, E. H. Moss (*Nature* [*London*], *133* (*1934*), *No. 3366, p. 689*).—The discovery is reported of concentric rings of cork in the wood of older subterranean parts of *Epilobium angustifolium*, *E. latifolium*, *Gaura coccinea*, and *Artemisia dracunculoides*. In *E. angustifolium* a zone of cork arises in the parenchymatous part of the wood formed near the close of the previous summer. Each new interxylary periderm arises in June, between the wood that served the previous year's aerial stem and the thin sheet of new wood connecting with the young shoots. The younger parts, fitting in sleevelike fashion over the older decadent cylinder, are therefore protected against possible desiccation and invasion of destructive organisms. The question is raised as to the general occurrence and significance of the internal suberized barrier, as well as concerning the physiology and ecology of perennating herbs devoid of this structural feature.

Abnormalities in the flower and fruit of Capsicum frutescens, H. L. Cochran (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 8, pp. 737–748, figs. 6*).—In this study of abnormal reproductive parts in peppers conducted at the [New York] Cornell Experiment Station, plants were grown in 1 gal. glazed crocks under high and low nitrogen treatments in the high (70°–80° F.), medium (60°–70°), and high uncontrolled (70°–110°) temperature greenhouses. Both abnormal flowers and fruits (fruits containing internal fruitlike bodies) were present under all conditions studied, however, and the number and percentage of the latter were greatest under the high nitrogen series at the higher temperatures. Histologically, the internal fruitlike bodies were usually found to be distinctly abnormal in character. They had no definite shape, outer layers such as those of the epicarp of typical fruits were lacking, and the style had no stylar canal.

Fungi and bacteria as indicators of the effects of petroleum oils on apple leaves, P. A. Young (*Phytopathology*, *24* (*1934*), *No. 3, pp. 266–275, figs. 2*).—According to this contribution from the Montana Experiment Station, the following organisms grew on agar submerged in petroleum oils: *Rhizopus nigricans*, *Mucor glomerula*, *Achlya conspicua*, *Helminthosporium sativum*, *Alternaria tenuis*, *Fusicladium alopecuri*, *Cladosporium* sp., *Aspergillus* sp., *Fusarium* spp., *Chromobacterium violaceum*, *Serratia marcescens*, *Sarcina aurantiaca*, *Achromobacter* sp., and *Bacillus subtilis*. These organisms, when tested in 22 petroleum oils, grew best in the least sulfonatable oils, especially in oils less than 11 percent sulfonatable. Apple leaves tolerated best those oils in which the fungi grew best. *R. nigricans* and *M. glomerula* were the best indicators of oils too toxic for commercial sprays on apple leaves.

To determine the toxicity of an oil, it is used in submerging an agar slant freshly inoculated with *R. nigricans*. For comparison, a similar slant is submerged in an unsulfonatable, hyaline petroleum oil. Only oils permitting luxuriant growth of *Rhizopus* probably will be tolerated by apple leaves.

The fungi are aerobes and were thought to use oxygen dissolved in the oils. The chromogenic bacteria did not produce their colors while submerged in oils. Protoplasm was flowing in the staminal hairs of *Zebrina* and *Tradescantia* from 3 to 8 hr. after immersion in red-stained petroleum oils. This showed tolerance to the oils. Fungi were reisolated from cultures of fungi submerged in oils for 227–318 days. Hyaline, nearly unsulfonatable petroleum oils are useful in preserving the appearances of organisms growing on agar slants. It is suggested that perhaps oils may be used to separate physiologic forms of organisms on the basis of survival of growth under different oils.

An automatic moisture-recording device, R. Winters and C. G. Small (*Phytopathology, 24 (1934), No. 3, pp. 284–288, fig. 1*).—An automatic device was constructed at the [New York] Cornell Experiment Station to record the length of time during which leaves were wet from rain or dew. The water film on the leaf closes an electrical contact in the grid circuit of a vacuum tube, causing a change in the plate current of the tube. This change in current operates an electromagnet, which in turn moves a pen up or down on a revolving drum. The details of construction are given.

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, April 1 to June 30, 1932 (*U.S. Dept. Agr., Inventory 111 (1934), pp. 93*).—Descriptive notes are given of 2,211 lots of plant material introduced for testing in different parts of the United States.

GENETICS

Complementary factors in barley giving a lethal progeny, G. A. Wiebe (*Jour. Heredity, 25 (1934), No. 7, pp. 272–274, fig. 1*).—The lethality of the F_1 of a cross between pure lines of Manchuria and Deficiens barley, studied by the U.S. Department of Agriculture in cooperation with the California Experiment Station, appeared due to complementary factors.

A chromosomal interchange in maize involving the attachment to the nucleolus, E. G. Anderson (*Amer. Nat., 68 (1934), No. 717, pp. 345–350*).—In an X-rayed culture of corn, studied at the California Institute of Technology, an interchange symbolized by T, involving chromosomes 6 and 9, took place within the reticulate region of chromosome 6 and about one-third the distance out on the long arm of chromosome 9. Linkage data with *c*, *sh*, and *wx* of chromosome 9 showed the interchange to be beyond waxy with 11.6 percent of crossing-over in the *wx*–T interval. The linkage data with *y* and *Pl* give the order as T–*y*–*Pl*. The percentage of crossing-over differed in reciprocal crosses: As female T–*y*=4.9, *y*–*Pl*=16.2; and as male T–*y*=17.3 and *y*–*Pl*=25.8.

Progressive mutations induced in Gossypium hirsutum by radiations, W. R. Horlacher and D. T. Killough (*Amer. Nat., 67 (1933), No. 713, pp. 532–538; abs. in Texas Sta. Circ. 71 (1933), p. 14*).—The progressive mutations produced in cotton by X-ray treatment of the dry seeds included a mutation from forked leaf shape to normal leaf shape induced in an F_1 cotton, which was heterozygous, *Nn*, and in homozygous forked leaf line, *nn*; and a mutation from virescent yellow leaf and plant color to normal green leaf and plant color. The mutation rate in each case was less than 1 percent. Evidence was also shown for reversible mutations in cotton. Indications were that a mutation was induced from normal leaf to forked leaf, the reverse of that from forked leaf to normal leaf. The induced mutation from virescent yellow to green was the reversal of the mutation from green to virescent yellow which previously occurred in nature.

Genetic relations of nankeen lint to plant color and leaf shape in upland cotton, J. O. Ware (*Arkansas Sta. Bul. 300 (1934), pp. 44*).—Nankeen cotton

with green plants, normal leaf shape, and yellowish-brown lint (*rr oo NN*) were crossed with red okra-leaf cotton having red plants, okra leaf shape, and white lint (*RR OO nn*). See also a previous note (E.S.R., 70, p. 170).

The F_1 progenies were intermediate, possessing dilute red plant color, an intergrade of leaf cleftness, and a lighter shade of yellowish-brown lint. The F_2 generation segregated into 27 clear-cut classes representing all possible genotypes of a trihybrid cross. When the F_1 was back-crossed on either of the immediate parental strains or on the more remote parental strains, winesap and okra leaf, the 8 genotypes obtained in each of the 4 cases were equal in number. In F_3, 8 of the 27 F_2 genotypes bred true for all 3 characters either in the dominant or recessive form, 12 of the genotypes were pure for 2 of the allelomorphic pairs and heterozygous for the third which split into a 1:2:1 ratio, 6 of the genotypes were homozygous for 1 character pair and segregated for the other 2 allelomorphic pairs into a $(1:2:1)^2$ ratio, and 1 genotype was heterozygous for all 3 character pairs which segregated in the same manner as the F_1 progenies. In the F_3 generation no other combinations than those observed in the F_2 occurred. The 27 genotypes recovered in F_3 segregated in the F_4 in the same manner as in F_3. Red plant color, okra leaf shape, and nankeen lint or their respective allelomorphs were observed to be genetically nonassociated. Nankeen lint, like green lint, is not linked with red plant color, okra shape leaf nor with green plant color or normal leaf shape.

Irregularities in the inheritance of the hairy-neck character transposed from Secale to Triticum, J. W. TAYLOR (*Jour. Agr. Res. [U.S.], 48 (1934), No. 7, pp. 603–617, figs. 3*).—The genetic stability and the behavior of hairy-neck wheat forms (E.S.R., 52, p. 223) in crosses with different wheat varieties are described. *T. vulgare* types having the hairy neck of *S. cereale* were not constant for the rye character. In spite of continuous selfing, a small percentage of smooth-neck and hybrid hairy-neck plants appeared. In hybrids between hairy-neck types and wheat, irregular ratios resulted and homozygous hairy-neck lines were much fewer than expected in the F_2 generation. Reciprocal backcrosses of the F_1 (hairy-neck × wheat) with wheat showed that the hairy-neck character was carried to a lesser extent than expected by both the egg cells and the pollen cells. Studies with pollen mixtures revealed that the hairy-neck pollen cell has either lower vitality or slower growth, or both, than the smooth-neck pollen cell. Addition of this rye character to the wheat complex evidently resulted in shorter plants with fewer tillers.

Inheritance of a leaf variegation in the common bean, M. C. PARKER (*Jour. Heredity, 25 (1934), No. 4, pp. 165–170, figs. 2*).—Reciprocal crosses made at the University of Wisconsin between a variegated strain of Pencil Pod Black Wax and the normal variety yielded all variegated seedlings in the F_1 when the variegated plant was used as mother. Variegation differed from a status in which all leaves showed variegation to that in which only a few showed chlorotic spots. In five F_2 families totaling 313 plants, 262 were variegated and 51 normal green color.

In the F_1 of the normal female by variegated male cross only one plant showed chlorosis and then only slightly. In the F_2, 28 of 381 plants were variegated.

The author concludes that cytoplasm, or its inclusions, must govern in some manner the expression of the variegated character.

Meiosis in some species and a hybrid of Paeonia, G. C. HICKS and G. L. STEBBINS, JR. (*Amer. Jour. Bot., 21 (1934), No. 5, pp. 228–241, figs. 20*).—At Colgate University studies of four species and one hybrid form of peony showed a basic chromosome number in the genus of five. However, in all the five peonies studied there was observed a general occurrence during meiosis of

various abnormalities, such as failure of the chromosomes to pair (asynapsis), abnormal separation of the chromosomes (nondisjunction), fragmentation, *polycary, and polyspory. Asynapsis was correlated in frequency with pollen* sterility and was most common in *P. smouthi*, which had only from 40 to 50 percent of apparently good pollen grains. Fragmentation occurring during the early anaphase is conceded of importance in species origination, since it results in gametes containing a deficiency in one or more chromosomes, and *chromatid fusion is given as a contributing cause of polyploidy.*

Chromosome number and self-fertility in Prunus virginiana and P. pennsylvanica, C. L. Becker (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 122, 123*).—At the University of Minnesota there were found 16 pairs of chromosomes in the pollen mother cells of *P. virginiana* and 8 pairs in *P. pennsylvanica*. Since other workers have reported 16 pairs in the pollen mother cells of sour and duke cherries and 8 pairs in sweet cherries, the author predicts that *P. virginiana* should cross more readily with the sour and duke than with the sweet cherries and that *P. pennsylvanica* should cross more readily with the sweet.

Controlled self-pollination of 74 racemes on one tree of *P. virginiana* yielded only 4 fruits, and on another tree 15 racemes produced only 4 fruits. Of 1,935 self-pollinated flowers of *P. pennsylvanica*, 25 yielded fruit.

Chromosome number of the Beta grape, E. Angelo and C. Becker (*Amer. Soc. Hort. Sci. Proc., 30 (1933), p. 104*).—Studies made at the University of Minnesota on the root tip cells of the Beta grape revealed 38 chromosomes, agreeing with the count previously reported by other workers.

Inheritance in an oak species hybrid, S. H. Yarnell (*Jour. Arnold Arboretum, 14 (1933), No. 1, pp. 68–75, figs. 8; abs. in Texas Sta. Circ. 71 (1933), p. 16*).—Observations at the Texas Experiment Station on 23 individuals of the F_1 generation of a cross between *Quercus virginiana* and *Q. lyrata* showed that growth characters in this generation varied widely, from individuals somewhat better than either parent to those that were decidedly dwarfed. The tendency for characters of one parent to be inherited together in the F_2 was striking. It is believed that not more than two principal factors are involved in the inheritance of the rather wide differences in leaf size, shape and texture, acorn size and shape, cupule and scale size, bark texture, and a tendency to deciduous or evergreen foliage. Lack of complete dominance was evident in both the first and second filial generations. As a practical deduction it is deemed possible that the evergreen character might be combined with hardiness to extend the range of the live oak northward.

Modification of the dominance of agouti to non-agouti in the mouse, E. F. Barrows (*Jour. Genet., 29 (1934), No. 1, pp. 9–15*).—Studies of dark agouti mice showed them all to be heterozygous for the nonagouti factor *Aa*. In crossing dark agoutis with an inbred wild-type strain and in back-cross and F_1 matings it was found that the inheritance of the dark type could be explained by the presence of at least two genes. One of these was the recessive allelomorph to agouti or a gene closely linked with it, and the other was a dominant factor U_1. The possibility of the existence of other modifying factors was also suggested.

Two cases of reverse mutations in the colour factors of rabbits, T. Marchlewski (*Jour. Genet., 29 (1934), No. 1, pp. 153–157*).—An account is given of the occurrence of an agouti rex male rabbit in a litter of 13 born to Chinchilla-rex parents at the Institute of Animal Breeding and Genetics of the Jagiellonian University, Poland.

On testing this individual with Chinchillas and albinos, and selected matings of his offspring, he was found to be heterozygous for full color and Chinchilla

dilution. He was considered to be a reverse mutation from Chinchilla albinism back to full color.

Another similar case of reverse mutation to full pigmentation in a related rabbit is described.

A colour mutation in the Rhode Island Red fowl, J. P. QUINN (*Jour. Genet., 29 (1934), No. 1, pp. 75–83, pl 1*).—The hereditary behavior of a red-splashed white color appearing in Rhode Island Red fowls of the U.S.D.A. Bureau of Animal Industry is described in crosses of such birds with Rhode Island Reds, White Wyandottes, Barred Plymouth Rocks, Jersey Black Giants, White Plymouth Rocks, and White Silkies.

The results of these matings demonstrated that the mutant character red-splashed white was recessive to the various colors and differed from the two types of recessive whites represented by the whites of Plymouth Rocks and Silkies. The white-splashed character was considered due to a factor *P*, causing an absence of the complete extension of pigment. However, the red-splashed birds carried the dominant factor *C* for chromogen and *O* for oxidase.

A case of gynandromorphic plumage in a pheasant re-examined in the light of Lillie's hypothesis of hormone threshold, J. S. HUXLEY and C. J. BOND (*Jour. Genet., 29 (1934), No. 1, pp. 51–59, pls. 2*).—The bilateral differences in the two sides of a gynandromorphic pheasant, described by Bond (E.S.R., 31, p. 271), are considered to be due to chromosome differences in the cells in the two sides of the body, with consequent differences in the response to the ovarian hormone.

Another pheasant with an abnormal color pattern, shot 30 years ago in the same district, is briefly described in a postscript. This is taken to suggest the existence of an albino strain for many years in the same district.

The inheritance of blue and brown colours in the goldfish, Carassius auratus, S. C. CHEN (*Jour. Genet., 29 (1934), No. 1, pp. 61–74, pls. 2*).—A study is reported from the National Tsing Hua University of China on the inheritance of blue and brown colors in goldfish characters found in China.

Crosses of blue and brown individuals with those of the wild-type produced all gray colored F_1s similar to the wild type. The F_1s in a cross of blue × brown varied from black to dark gray. Back-crosses of F_1s with blues produced 640 nonblues to 611 blues, and in the F_2 generation there were produced 4,325 nonblues and 1,383 blues.

Matings of blues with blues produced only blue offspring.

These findings led to the conclusion that blue is due to a single gene, recessive to the normal, which produced gray, black, or other nonblue colored types.

Matings between browns produced only browns, and the F_1s from a brown × wild type cross were gray in color. In the back-cross there were produced 2,867 gray colored fish and 189 browns, approximately a 15:1 ratio.

The results of different matings are analyzed separately, and all suggest that four pairs of recessive factors are necessary for the production of brown fish.

A new true-breeding blue-brown fish was produced, recessive for the five pairs of genes. Microscopic studies are reported of the pigmentation of the scales of this type in comparison with the pigmentation of the scales of other goldfish.

Linkage in transplantable tumours, J. J. BITTNER (*Jour. Genet., 29 (1934), No. 1, pp. 17–23, figs. 2*).—In a study of the inheritance of susceptibility of mice to three spontaneous tumors, it was found that 7 or 8 genetic factors were needed. One of these was linked with the dilution color factor. Crosses were

made between susceptible and resistant stocks with the production of F_2 and back-cross generations.

Studies on the creeper fowl.—VI, Skeletal growth of creeper chickens, with special reference to growth of the long bones, W. LANDAUER (*[Connecticut] Storrs Sta. Bul. 193 (1934), pp. 79, figs. 19*).—Continuing this series (E.S.R., 69, p. 196), data are recorded on growth and body weight and length and diameter at the proximal and distal epiphysis and diaphysis of the long bones of creeper and normal fowls at daily intervals from the seventh to twenty-seventh day of incubation, weekly intervals up to 4 weeks, and at 6, 8, 13, and 26 weeks of age, separation also being by sex in the last two groups. In practically all cases there were 10 birds in each group.

The results showed that body weight of creeper and normal embryos was approximately the same, but from the fourth week of postnatal life creeper chicks had a definitely lower body weight than normals. The long bones of creepers were shorter than those of normal chicks, and this difference was found to exist even in 7-day-old embryos. However, the spurts of growth were similar in the two types.

The breadth of the diaphysis of the long bones of creeper embryos was at first narrower and later wider than that of normal embryos. Variations were observed in this relationship between different bones during growth.

Studies of the phalangeal bones of the toes during postnatal development showed that the phalanges of the first, second, and third toe of creepers were somewhat shorter than normals during most of the growth period, but no definite differences were shown in the length of the phalanges of the fourth toe.

As a result of these conditions all creeper indices of long bone length were quite different from those observed in the normals except in the tarsometatarso-tibial index.

An increased variability of creeper females as compared with males was evidently due to the relatively greater degree of shortening of the male bones and the longer growth period of creeper females as compared with normal females.

The variability of bone length, as shown by the coefficients of variation, was higher in creepers than in normals during incubation as well as after hatching, the explanation being that new sources of variability created by the creeper mutation operated during the embryonic and postnatal growth period.

It was also found that the more distally a bone was located in the carcass the later it was laid down during development and the greater was the percentage of reduction in length in creepers.

The changes in growth rhythm and growth intensity shown by creeper bones were found to be secondary to the general growth retardation of the creeper gene.

It is concluded that the typical features of creeper bones (chondrodystrophy) are the result of an inhibition of differentiation by retardation of growth.

Detailed data on the growth rate are presented in a series of tables in the appendix and shown graphically in the text.

FIELD CROPS

[Agronomic experiments in Alabama, 1932], R. Y. BAILEY, G. L. FICK, E. V. SMITH, H. B. TISDALE, E. L. MAYTON, D. G. STURKIE, and J. F. DUGGAR (*Alabama Sta. Rpt. 1932, pp. 10–14, 22, 28, 29*).—Continued research with field crops (E.S.R., 66, p. 820), reported on briefly, dealt with methods of preparing land for cotton; shoot formation and the effect of clipping aerial shoots of nut-

grass upon reserve carbohydrates; variety tests with soybeans; fertilizer treatments applied to different seed mixtures for permanent pasture on upland soils; time of cutting Sudan grass and Johnson grass for hay; fertilizer studies with Italian ryegrass; trials of introduced grasses, legumes, and other forage plants; effect of fertilization on root nodules and correlation between yield and nodule numbers or numbers of main branches, both with Spanish peanuts; and nodule numbers on lespedeza as affected by inoculation of Korean lespedeza and by fertilization.

[Agronomic research in Delaware], G. L. SCHUSTER, H. C. HARRIS, and C. E. PHILLIPS (*Delaware Sta. Bul. 188 (1934), pp. 15, 16, 17*).—Brief reports are again (E.S.R., 69, p. 37) made on the progress of fertilizer experiments with wheat, alfalfa, and barley; tests of alfalfa varieties; cutting tests with alfalfa; storage tests with sweetpotatoes fertilized with different potassium salts; and pasture stimulation by spring top-dressing, and the supplementing of permanent pasture by Sudan grass.

[Field crops work in Maryland] (*Maryland Sta. Rpt. 1933, pp. XIII–XV, XXVI, XXVII*).—Variety tests with alfalfa, red fescue, and wheat; improvement work with alfalfa, wheat, barley, and potatoes; trials of tall meadow oatgrass for sandy land; fertilizer tests with potatoes and sweetpotatoes; spraying and dusting tests with potatoes; and studies on the control of crabgrass and weeds with chemicals, are noted briefly.

A rapid method of planting small field plats of row crops, J. R. QUINBY and J. C. STEPHENS (*Jour. Amer. Soc. Agron., 25 (1933), No. 7, pp. 493, 494*).—A method of planting small plats of row crops by the use of a modified ordinary 2-row press-wheel cotton and corn planter is outlined, and its merits are indicated.

A new table of odds based on Student's table of probability, S. R. MILES (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 341–346*).—A contribution from the Indiana Experiment Station.

Root development of perennial grasses and its relation to soil conditions, H. B. SPRAGUE (*Soil Sci., 36 (1933), No. 3, pp. 189–209, figs. 2*).—Periodic harvest of roots of grasses at the New Jersey Experiment Stations, using an original method for determining the abundance of roots for pasture and turf grasses, revealed that Kentucky bluegrass and colonial bentgrass both regenerate a large part of the root system each spring. The growth of Kentucky bluegrass roots begins several weeks earlier and is completed earlier than that of the bentgrass roots. Practically all of the roots of both species were found in the upper 9 in. of soil.

Colonial, seaside, and velvet bent tolerated mowing as close as ¼ in., although the amount of roots developed with ¼-in. cutting was considerably less than for ⅞ in. Regular clipping at ⅞ in. did not restrict root development of Kentucky bluegrass, but did reduce the root growth of redtop, suggesting that bluegrass is the better suited for the repeated clipping occurring on pastures and lawns. The ratio of root to top also was consistently greater for the longer height of cut on all grasses.

The residual effect of fertilizers on the soil appeared to be of great importance. Soils that were strongly acid, either natural or as a result of continued use of acid-forming fertilizers, seemed to affect greatly the abundance of roots. The roots normally dying and decaying each season fail to decompose on strongly acid soils, and as a result the increased quantity of roots in the upper layers hampers top growth. Slowly available nitrogenous fertilizers permitted somewhat greater root development than soluble fertilizers supplying equal amounts of total nitrogen. Since relatively high ratios of

soluble nitrogen to carbohydrate reserves favor top growth rather than root development, it seemed possible that early spring applications of available nitrogenous fertilizers in abundance may reduce the quantity of new roots formed and thus limit utilization of the soil resources for the remainder of the season.

The palatability of the self-establishing species contributing to different types of grassland, W. E. J. Milton (*Empire Jour. Expt. Agr., 1 (1933), No. 4, pp. 347–360*).—Examination of the relative palatability of miscellaneous herbs, grasses, and clovers on widely differing types of grazing land, made by the Welsh Plant Breeding Station, showed that the miscellaneous herbs can be grouped into highly palatable, moderately palatable, and definitely unpalatable classes. The relative palatability of the miscellaneous species was about the same for each type of grazing land examined, but the grasses varied, chiefly due to stage and type of growth and the presence of burn. The choice of the animal between miscellaneous herbs and grasses in lowland fields, and also between the individual species composing hill pastures, was shown to be influenced markedly by the factor of burn on the one hand and of winter greenness on the other. The importance of the miscellaneous herb group in terms of relative productivity and amount eaten is indicated, and the mineral and dry matter contents are discussed.

Grassland management and its influence on the sward, IV, V, M. G. Jones (*Empire Jour. Expt. Agr., 1 (1933), No. 4, pp. 361–367*).—The series (E.S.R., 70, p. 765) is continued.

IV. *The management of poor pastures.*—The response of an old permanent pasture to fertilization and controlled grazing, especially as to botanical composition, and of a run-down pasture to plowing, reseeding, and to mowing v. fertilizers and controlled grazing is described.

V. *Edaphic and biotic influences on pastures.*—Results obtained in the experiments indicate that edaphic conditions only govern the botanical nature of a turf, indirectly bearing particularly on production of crops, whereas biotic factors have somewhat smaller influence on quantity but exert greatest influence in selective grazing and through differential weakening of the various species. A close interdependence exists between the plant and animal members within the agricultural biotic communities, and although the edaphic and climatic factors do influence the botanical composition of pastures, their full significance cannot be understood unless due regard be paid to the biotic factor.

Pasture investigations in southern Delaware, G. L. Schuster and C. E. Phillips (*Delaware Sta. Bul. 189 (1934), pp. 32, figs. 5*).—Variously fertilized plats on Sassafras sandy loam soil near Coolspring were sown broadcast in 1926 with a pasture mixture and were grazed with producing dairy cattle (receiving supplemental grain and forage) beginning in 1927. The yield and composition of grass clippings were also determined for each treatment in 1929, 1930, and 1931. Lack of moisture during July and August and the prevailing sandy soil types are the limiting factors in permanent pasture production in southern Delaware. See also an earlier note (E.S.R., 63, p. 631).

The most green grass, dry matter, and crude protein per season were produced by a plat receiving Leunasalpeter, which was followed by a manure-superphosphate plat and a sodium nitrate plat. The data suggest that spring application of fertilizers probably will advance grazing 7 to 10 days in the spring and intensify the spring (May and June) flush, but does not materially increase the number of grazing days during July and August, a period of shortage. An annual supplementary pasture crop, preferably Sudan grass, seemed to be the most promising means of furnishing pasture during this period.

Results indicate that Sudan grass may reasonably be expected to carry one cow per acre from about July 1 to September 1 in normal seasons. Analyses by M. W. Goodwin showed that Sudan grass about equals permanent pasture in protein content, although its hay contains considerably less protein than alfalfa or several other hays.

Improving pastures in New Jersey, H. B. SPRAGUE, N. F. FARRIS, and C. S. CATHCART (*New Jersey Stas. Bul. 565 (1934), pp. 47, figs. 9*).—The effects of lime and various fertilizer materials on growth of forage plants and weeds, total yield and seasonal production of feed, and feeding quality and mineral content of herbage produced were studied from 1929 to 1931 on well established but previously untreated pastures, on Collington loam near Jamesburg, on Bermudian silt loam near Skillman, and on Chester gravelly loam near Annandale. Each experiment consisted of 24 plats with a portion of each plat clipped at 2-week intervals, and the remainder grazed and occasionally mowed to control weeds and unpalatable growth.

On the Chester gravelly loam where the original major forage species were Canada bluegrass, redtop, and timothy, with a little Kentucky bluegrass and white clover, superphosphate strikingly increased the clover with greater occupation of soil by all vegetation and fewer weeds. Lime and manure benefited forage species, especially when combined with superphosphate. The plant population on the Collington loam resembled that on the Chester soil but responded much less to treatment. Manure produced the greatest improvement in abundance of forage plants, white clover in particular. Sodium nitrate and ammonium sulfate increased the grass : weed ratio and tended to inhibit the growth of clover. On the Bermudian silt loam pasture, occupied at first largely by Kentucky bluegrass, little change occurred in plant population, although lime and superphosphate improved density of growth. Mowing periodically helped to eliminate wild carrot, was ineffective in controlling other weed types, but greatly increased the attractiveness of all the pastures to stock.

The effects of lime, manure, phosphate, and potash on total yields were largely dissipated by the end of the second season. The most effective materials varied with soil type; in general, treatments producing significant changes in character of plant populations likewise affected total growth. Manure was the most valuable material on Collington loam, lime on Bermudian silt loam, and superphosphate on Chester gravelly loam. Combinations of materials produced the greatest improvements in yields, the maximum increases coming from lime-manure treatment on Collington loam and on Bermudian silt loam and lime-phosphate-potash on Chester gravelly loam.

Seasonal production of feed was featured usually by good early season growth in response to soil moisture reserves, which decline in May and June until a critical soil moisture content in mid-June with consequent fall in growth rate; a chronic soil moisture shortage and reduced herbage yield in July and August; lower temperatures with better rainfall conditions and stimulated production in September; and cessation of growth in October. The Bermudian silt loam made the most effective use of rainfall in July and August, and the Collington loam the least. The effect of lime, phosphate, and potash on seasonal production was similar on all three pastures, even though the various materials differed greatly in value. In general, improvements in total yield with lime or minerals also resulted in more satisfactory production during the summer period. Sodium nitrate and ammonium sulfate stimulated early season growth, usually at the expense of production in July and August, whereas manure did not stimulate such early growth but maintained growth longer after the normal zenith period.

Analyses of herbage for each plat of the Chester gravelly loam pasture in 1929 indicated that proper grazing alone will produce herbage superior in protein and carbohydrates to that of alfalfa in the usual hay stage, and more than twice as high in protein as grasses in the hay stage. Protein content was significantly improved by treatments increasing the proportion of clover in the herbage. Stimulation of the proportion of clover in the herbage from 5 to 25 percent increased the phosphorus content about 50 percent on this pasture.

Limestone and other factors in pasture improvement, S. C. Hartman and D. R. Dodd (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 94–97*).—Limestone was the most effective material applied in pasture improvement at the Southeastern Experiment Farm from 1915 to 1927 on unproductive, sour, Meigs silt loam, grazed largely by sheep. Manure and superphosphate together produced immediate and very marked results and addition of limestone gave further and more lasting improvement, whereas other treatments were of doubtful value unless with limestone. Limestone alone was slow compared with manure and other fertilizers, but in recent years it outstripped all other treatments, and it was as effective 6 yr. after the last treatment as at any previous time. Lime, manure, and superphosphate produced quick and prolonged results. Lime and fertilizers were slower to show results but recently were as effective and enduring as where manure was included.

The relative palatability of seeds-mixtures, and a study of the influence of fertilizers on natural hill pastures, W. E. J. Milton (*Empire Jour. Expt. Agr., 2 (1934), No. 5, pp. 51–64*).—Comparisons of the relative palatability of simple seeds-mixtures in conjunction with single-species plats showed that timothy formed the basis of the most palatable mixtures, although it was not the hardest grazed among the pure plats. There was an indication that grazing becomes more uniform among contrasting mixtures in proportion to the addition of species to their composition. Sheep on mixture plats selected mixtures as such rather than individual species from mixtures. A high palatability of red clover growing under conditions which allow the grazing animal an alternative diet was disclosed.

Investigation of the effect of fertilizers and lime upon the palatability of hill pastures disclosed the direct effect of the fertilizers upon the nutrients of the plant and botanical change which depends upon the first in conjunction with the grazing animal. Fertilizers with uncontrolled grazing could effect marked improvement in open- and enclosed-hill *Festuca-Agrostis* associations and an open-hill *Molinia* association but especially in the *Molinia* pasture. Beneficial results of firing a *Molinia* pasture in early spring was indicated. Complete fertilizing, including lime, gave the best results in terms of relative palatability. The effect of lime, alone or in combination with fertilizer, was evident and much more marked than that of superphosphate. A combination of phosphatic, potassic, and nitrogenous fertilizers with lime resulted in the removal of the major factors hindering hill improvement.

Forage-crop field experiments at West Point, Miss., T. F. Akers and H. L. Westover (*U.S. Dept. Agr., Tech. Bul. 419 (1934), pp. 20, figs. 7*).—Experiments with forage crops carried on in cooperation with the Mississippi Agricultural College and Experiment Station since 1925 were aimed at the causes and remedies for alfalfa failure on limestone soils of the prairie belt of Alabama and Mississippi. These experiments suggest that the decline in yields and in longevity of stands is associated with the lack of available phosphorus, humus deficiency, and poor cultural practices.

Common alfalfa from Kansas, Utah, and the Dakotas proved most satisfactory for the section, while alfalfa of the hardy group did not yield as much hay and those of the nonhardy group were not cold resistant enough. Applications of

stable manure alone or in combination with phosphatic fertilizers gave the best yields of alfalfa, and superphosphate and basic slag alone also increased yields, while nitrogen and potash did not seem to affect the growth. Alfalfa should not be seeded later than April 15 in the spring or October 15 in the fall. Cutting too often and too early has injured the stands, the safest stage of cutting in this section being when new basal shoots appear. Cultivation of alfalfa was not profitable, although the later cuttings on cultivated plats contained fewer weeds. No serious diseases have been prevalent, and insect damage has been slight.

Tests with other forage crops that appeared promising for the section were more or less incidental to the alfalfa experiments. Soybeans proved well adapted to the prairie limestone belt and can be grown on areas not adapted to alfalfa. Combinations of corn and soybeans resulted in lower yields of corn but enabled the grower to raise more feed on the same area. Sorgos are much more desirable than grain sorghums for forage and produced a greater tonnage than corn. Corn varieties on land of medium fertility unfertilized made very low yields under continuous cropping, but increased yields were made by corn after alfalfa fertilized with phosphatic fertilizers and stable manure. Cutting tests showed that Johnson grass should be cut for hay just before blooming or as soon as the first few blooms appear. Heavy disking or shallow plowing of the sod every 3 yr. increased the productivity. Sudan grass broadcasted can serve as a good emergency hay crop where Johnson grass is not established. Sweetclover is adapted to about the same soils as alfalfa and will thrive on poorer soils. Crotalarias, pigeonpeas, and velvetbeans were less desirable than soybeans, and lespedezas were not promising for hay on the heaviest soils. Hairy vetch and Austrian winter peas were the most promising winter legumes. Winter wheat and rye were useful winter cover crops, alone or in combination with legumes, but no dependable winter-hardy varieties of oats and barley were found.

[Forage crops investigations in Wales] (*Welsh Jour. Agr., 10 (1934), pp. 131–295, pl. 1, figs. 4*).—Further research (E.S.R., 69, p. 644) with forage crops, meadows, and pastures, carried on in Wales, is reported in articles entitled Seed Yields of Pedigree and Commercial Grass Strains, by G. Evans (pp. 131–142); The Management and Manuring of Pasture Plants in Relation to Soil Establishment and Productivity, by W. Davies (pp. 142–160); Some Observations upon the Relative Performance of Commercial and of Indigenous Forms of Some Grass Species Under General Farm Practice (pp. 160–164) and Further Observations on the Effect of Various Manures on the Herbage of Meadow-Land (pp. 165–173), both by R. A. Roberts and J. O. Thomas; The Effect of Manures at Different Altitudes on the Nitrogen and Mineral Content of Grass and Clover Species, by T. W. Fagan and W. E. J. Milton (pp. 174–189); The Recovery of Nitrogen in Pastures from the Application of Nitrogenous Manures—III, The Recovery of Nitrogen in Swards under the Warmbold System, by T. W. Fagan and R. O. Davies (pp. 190–196) (E.S.R., 68, p. 320); The Effect of Controlled Grazing and Manuring on Natural Hill Pastures, by W. E. J. Milton (pp. 196–211); Trials with Strains of Cocksfoot and Observations on the Policy of the Station in Relation to Their Distribution and Use, by R. G. Stapledon (pp. 211–223); The Influence of Manuring on the Yield and Botanical Composition of Lowland Pastures—(a) under Controlled Grazing by Sheep, (b) under Hay Conditions, by T. E. Jones (pp. 223–235); The Use of a Culture Inoculant for Clover, by A. A. Poulter (pp. 235–237); The Persistency of Various Grasses and Clovers When Sown in Pure Plots and in Mixtures on Peat Land, by M. Griffith and T. E. Jones (pp. 238–246) Pasture Manage-

ment and Its Effect on the Sward (pp. 246–267) and A Seeds Mixture Experiment in Mid-Cardiganshire (pp. 267–278), both by L. I. Jones; The Inimical Effects of Presoaking on the Seeds of Oats (pp. 278–284) and "Suction-Force" Measurements on the Seeds of Some Varieties of Oats (pp. 289–295), both by R. G. Walker; and The Effect of "Ceresan" on the Germination of Grass-Seeds (pp. 284–288), by H. G. Chippindale.

A biometric study of the culms of cereals and grasses, H. Prat (*Canad. Jour. Res., 10 (1934), No. 5, pp. 563–570, figs. 6*).—An attempt to express by plain graphs the absolute average lengths and also the relations of length between the internodes of the culm is made in this contribution from the University of Montreal. In some cases, the graphic representation leads to a simple mathematical formula. In others this is not possible, but the shape of the graph gives interesting information on the role of the young inflorescence during culm growth. Sterile or, on the contrary, hypersexual culms have their early history inscribed in their adult structure.

A comparison of the dry matter content of annual lespedezas, alfalfa, and soybeans, R. E. Stitt (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 533–535*).—Examination of material grown at the Piedmont (North Carolina) Branch Station in cooperation with the U.S. Department of Agriculture and cut at several growth stages revealed distinct, although slight, differences in dry matter contents between the common, Tennessee No. 76, Kobe, and Korean varieties of annual lespedeza. At the usual haying stage, Utah common alfalfa and Laredo soybeans had significantly lower dry matter contents than did annual lespedeza.

The calcium, phosphorus, and nitrogen content of grasses and legumes and the relation of these elements in the plant, H. A. Daniel (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 496–503*).—The chemical composition of 368 samples of grasses representative of 23 species collected from virgin soil in 52 counties of Oklahoma, and of 335 samples from 10 different legumes was studied at the Oklahoma Experiment Station.

The grass samples averaged in calcium 0.351 percent, phosphorus 0.103, and nitrogen 0.868, and the legumes averaged 1.373, 0.18, and 2.283 percent, respectively. The mineral content of the plants low in calcium and phosphorus remained low when they were grown on fertile soil. Crops high in calcium and phosphorus always contained large amounts of these elements, even on poor soil. The legumes had low nitrogen-calcium and high calcium-phosphorus and nitrogen-phosphorus ratios, while the grasses had high nitrogen-phosphorus and low calcium-phosphorus and nitrogen-calcium ratios. A very low correlation existed between the calcium and phosphorus contents of the grass, and these elements were correlated negatively in mature legumes. Plants extremely low in phosphorus were usually high in calcium, and vice versa. A poor correlation existed between nitrogen and calcium content of the plants, while the nitrogen and phosphorus were correlated closely.

The comparative ability of seedings of alfalfa, clovers, and grasses to survive drought, H. L. Dunton and C. R. Megee (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 258, 259, figs. 4*).—Seedings of alfalfa, red clover, alsike clover, and reed canary grass each alone, alfalfa and grass mixtures, clover and grass mixtures, and grass mixtures made in the spring of 1933 under favorable conditions but followed about a week later by drought demonstrated the superior drought resistance of alfalfa compared to the clovers and more particularly to the grasses.

Lime requirements of alfalfa on Wisconsin soils, H. H. Hull (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 506–513*).—Determinations of available

phosphorus and pH made at the Wisconsin Experiment Station on unlimed soils gave indications that pH 6.5 or above may be important for a good supply of available phosphorus. A slight correlation was found between the amount of exchange calcium and the response to lime, a general correlation between the percentage base saturation and the soil acidity, and a correlation also between the percentage base saturation and the response to lime. A reaction of pH 6 marked the line between response and no response; however, a much greater response occurred on the light-colored than on the dark-colored soils. Alfalfa responded to lime most on the first crop, while after the plants became more deeply rooted unlimed plats made somewhat better growth. Additions of ground limestone to different soils did not have the same effect on their reaction, dark prairie soils appearing to be more highly buffered than light-colored soils. Studies of subsoil from different fields showed that if lime and plenty of available phosphorus are present within 5 ft. of the surface the needs of alfalfa may be satisfied, even though the surface horizon is deficient in these nutrients.

The duration of the favorable influence of alfalfa on the cotton fields of Armenia, K. P. Mirimanian (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 475–480*).—During 4 yr. of uninterrupted cultivation to cotton following prolonged cropping to alfalfa (E.S.R., 63, p. 334), the soil underwent many changes. In the first year of cotton cultivation (1929), i.e., just after alfalfa was plowed under, the humus, total nitrogen, and exchangeable calcium increased noticeably, accompanied by a slight increase of moisture-holding capacity and total porosity. From this point on, however, these values decreased slowly with a rather sharp decline by 1932. Favorable conditions created in the soil by prolonged cultivation to alfalfa were conserved during the first 3 yr. of cotton but began to disappear in the fourth year of continuous cotton. The yield of cotton was in harmony with the changes in the soil. The 6 percent increase in yield in 1930 was explained partly by a surplus of nitrogen from the decomposition of the alfalfa. Under conditions prevailing in the Echmiadzin district of Armenia the favorable influence of alfalfa seems to persist for 3 yr. but begins to decline from then on.

"**Alfalfa yellows**", F. W. Poos and H. L. Westover (*Science, 79 (1934), No. 2049, p. 319*).—The authors point out from their 5-year study that in the latitude of Arlington Experiment Farm, Va., and of Columbus, Ohio, the problem of control of this injury by cutting is much more complicated than inferred by the observation of Graber and Sprague (E.S.R., 70, p. 610) which applied to Wisconsin conditions. The period of ideally favorable environmental conditions for the development of this leaf hopper, combined with the amount of migration from nearby maturing or harvested crops or from more distant areas as well as the stage of growth at which the crop is attacked, extremely important factors in determining the amount of injury to alfalfa caused at any one time by *Empoasca fabae*, must all be considered and their influence determined before any cutting schedule for alfalfa is adopted for controlling injuries caused by *E. fabae*.

Statistical determination of barley varietal adaptation, F. R. Immer, H. K. Hayes, and L. Powers (*Jour. Amer. Soc. Agron., 26 (1934), No. 5, pp. 403–419*).—The analysis of variance was applied to tests of 10 barley varieties grown in 1930 and 1931 in randomized blocks at the Minnesota Experiment Station and at 5 substations in different localities in the State. The method for calculating the variance of the different components of the total variation is illustrated. The interactions of varieties×stations, varieties×years, and varieties×stations×years significantly exceeded error, indicating that some barleys reacted differently in different stations, in different years, and in cer-

tain stations in specific years. The variety mean square significantly exceeded the mean squares for interaction of varieties×stations and varieties×years, showing that some varieties were significantly superior to others in spite of differential responses.

The fertilizing value [for barley] of green manures rotted under different conditions, J. A. Daji (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 466–475, figs. 2*).—Plumage Archer barley receiving young tares (vetch), young mustard, and sugar beet tops as green manures at the Woburn Experimental Station, no matter how they were applied, benefited in accelerated germination, increased tillering, and in larger yields of grain and straw than the control, and the same held for commercial fertilizers containing the same nutrients as the green manures. The yield of grain and straw was correlated with tillering capacity but not with height. Increased tillering and yield seemed due primarily to the nutrients in the green manures, chiefly the nitrogen. When buried at once the green manures resulted in higher yields of grain and straw than when applied to the surface or rotted separately.

A rare specimen of Zea mays var. saccharata, A. T. Erwin (*Science, 79 (1934), No. 2061, p. 589*).—An ear collected by E. H. Morris in Aztec Ruin, New Mexico, identified at the Iowa Experiment Station as sweet corn and estimated as grown between 1200 and 1300 A.D., is held to prove that sweet corn existed in pre-Columbian times. A specimen collected in Peru has been described by Hendry (E.S.R., 63, p. 826).

A statistical study of the growth of main stem in cotton, M. Afzal and S. S. Iyer (*Indian Jour. Agr. Sci., 4 (1934), No. 1, pp. 147–165, figs. 5*).—When exponential curves of the form $H=Ae^{bT}$ (where H=height in centimeters, A a constant, the theoretical height at the time of germination, e the base of the logarithms, T time in days from germination, and b relative growth rate per day), were fitted to height measurement data of cotton covering a 7-year period and a comparison of the values of b or the efficiency index made, American varieties had numerically less relative growth rate than *Gossypium indicum mollisoni*. The values of b estimated for Punjab cottons compared favorably with those observed for South African varieties grown at Barberton (E.S.R., 67, p. 33). Full statistical details are given for fitting the curve and for comparison of two values of b by the method of pooled variances. A high coefficient of correlation was evident between the value of b and the average relative growth rate for the whole period of growth.

Cotton spacing experiments in the Mesilla Valley, New Mexico, A. R. Leding and L. R. Lytton (*New Mexico Sta. Bul. 219 (1934), pp. 38*).—Spacing experiments with Acala cotton made in cooperation with the U.S. Department of Agriculture from 1926 to 1932, inclusive, provided for spacings of 1 plant to 12, 18, and 24 in. of row, 2 to 12 in. of row, blocked-out rows, and unthinned rows. Spacing of plants at medium distances, such as 1 or 2 plants to 12 in. of row, appeared most favorable for maximum early production and for large yields. Too close spacing tended to reduce the quantity of cotton at the first picking and total yields usually were smaller than from medium spacings. Wide spacings, such as 18 and 24 in., did not compare favorably either in first picking or total yields with 12-in. spacings. In total yield and especially in the first pickings the 12-in. spacings usually produced more than the blocked-out and the unthinned rows. Two plants every 12 in. seemed better than 1 every foot and 12-in. rows better than 18-in. rows.

Accuracy of the percentage of lint cotton determined on small laboratory gins, J. T. Vantine (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 531–533*).—When 20 10-lb. samples from a thoroughly mixed lot of Startex 582 seed cotton were ginned at the Texas Experiment Station on a 20-saw gin and

50 200-g samples and 50 50-g samples of the same lot on an 8-saw gin, the error in percentage of lint of these samples was small. One representative sample carefully handled was enough for a reliable determination of lint percentage, so that the size of sample is not so important if a representative sample is used. Correction for differences between the different sizes of samples used probably is not warranted. See also earlier notes by Quinby and Stephens (E.S.R., 65, p. 631).

Effects of temperature and humidity upon length of rest period of tubers of Jerusalem artichoke (Helianthus tuberosus), C. E. STEINBAUER (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 403–408*).—Jerusalem-artichoke tubers of four varieties were subjected to 18° F. and very low humidity, 32° and low humidity, 32° and high humidity, 36° and high humidity, 50° and high humidity, and fluctuating temperatures of field pits for from 15 to 105 days The samples taken at 15-day intervals were planted in moist peat in a cool greenhouse and subsequently examined periodically. Indications were that 32° with both high and low humidities and 36° and high humidity were very effective in shortening the rest period, as much as 75 to 135 days compared with controls, while 50° and high humidity conditions were much less effective. The fluctuating temperatures in the field pits caused a shortening of dormancy intermediate between that at 50° and the 32° and 36° conditions. Actual freezing injury occurred at 18° and very low humidity, very little shortening of the rest period was evident, and losses from rotting were high.

New potato varieties, F. J. STEVENSON and C. F. CLARK (*Amer. Potato Jour., 11 (1934), No. 4, pp. 85–92*).—The current status of the Katahdin and Chippewa (E.S.R., 70, p. 177) and Golden potato varieties is reported, with a partial progress report on potato-breeding work in cooperation with the U.S. Department of Agriculture and several State experiment stations.

Katahdin continued to be free from mild mosaic and was gaining favor with growers in different parts of the country because of its usual production of a high percentage of smooth prime potatoes. Chippewa was preferred to Katahdin in some sections as it is somewhat earlier and produces slightly higher yields under comparable conditions. Golden, a yellow-fleshed variety, had not been tested enough to determine its adaptation. Under the favorable conditions prevailing at Presque Isle, Maine, in 1931 and 1932 it outyielded Green Mountain decisively, and also outyielded it again in 1933. Tests reported from other sections in 1933 were not promising.

Relation of soil reaction to tuberization, rate of growth, development, and partial composition of the potato, O. SMITH (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 398–402*).—Smooth Rural potato tubers were grown at Cornell University in soils with reactions ranging from pH 4.68–4.9 to 7.16–7.45, and 100 hills were harvested from each series at each of five dates during the growing season. The fresh weight of tops at pH 4.68–4.9 was usually smaller than for those grown at higher pH values, whereas those grown at pH 7.16–7.45 had the largest fresh weight of tops at each harvest. At maturity the highest acidity plats produced the lowest weight of tubers per plant and the lowest acidity plats yielded the greatest weight, with intermediate reactions producing yields within the extremes. During 1932 fewer tubers were infested with scab as the pH of the soil rose beyond pH 6.51. The most scab was found on tubers grown at pH 6.08–6.51, with a decrease as soils were more or less acid.

At each soil reaction the dry matter contents of tubers smaller than 1 g decreased rapidly after the first harvest, whereas tubers weighing more than 1 g continued to gain in dry matter percentage until the third, fourth, or fifth harvest. When tubers of 50 g and over were considered, the dry matter per-

centage in tubers grown at pH 5.64–6.05 was usually higher than at higher or lower reactions. The starch percentage of tubers grown at pH 5.64–6.05 exceeded that of tubers grown at either the higher or lower pH range. A relationship was indicated between better table quality of potatoes for boiling and a somewhat lower percentage of starch as brought about by immature harvesting or growth at soil reactions of rather high pH.

Influence of commercial fertilizers on yields, grades, and value of potatoes in Hood River Valley, G. G. BROWN (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 394–397*).—Fertilizer trials with Russet Burbank potatoes on Parkdale loam at the Oregon Experiment Station demonstrated the superiority of alfalfa or sweetclover over red clover as green manure through a wide range of fertility conditions, that N–P or N–P–K fertilizers were most effective and economical, that a consistent upward trend in yields was associated with increased use of fertilizers, and that combined sulfur is valuable in potato fertilizers of the type used and under the soil conditions.

Controlling the shrinkage of skinned potatoes in storage, W. M. PEACOCK, R. C. WRIGHT, and T. M. WHITEMAN (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 415–419*).—The shrinkage of skinned Irish Cobbler tubers varied from 1.8 percent at 60° F. to 16.3 percent at 32° and non njured potatoes from 1.8 to 5.1 percent, respectively, by the end of 12 weeks. Potatoes stored at 70° shrank slightly more than at 60°. Large shrinkage losses were controlled by storing the potatoes at the higher temperatures until about the end of the rest period and then gradually reducing the temperature enough to prevent sprouting. Storage temperatures of 40° and below prevented normal wound periderm formation, with skinned areas soon forming a dark brown or black scab, and also decreased the culinary quality of table stock and reduced the yield from seed potatoes. Effects of low storage temperatures could be detected by the more watery, coarser grain and darker texture of the cut tubers.

Varietal characters and classification of the rices of eastern Bengal, G. P. HECTOR, S. G. SHARNGAPANI, ET AL. (*Indian Jour. Agr. Sci., 4 (1934), No. 1, pp. 1–80, pls. 7, figs. 4*).—This account of varietal characters and classification of Bengal rices describes 856 types of transplant Aman and 931 of highland Aus, classed into 540 varieties. The varieties are divided into common (translucent) rices, glutinous rices, winged rices, clustered rices, and double-grained rices, and further varietal classification is based on color in vegetative parts, awning, color of ripe husk and of husked grain, and consistency, shape, size, and quality of grain. Within varieties, types are grouped further into highland Aus and transplant Amans, according to date of sowing and harvest and maturity.

Bulk emasculation of sorghum flowers, J. C. STEPHENS and J. R. QUINBY (*Jour. Amer. Soc. Agron., 25 (1933), No. 3, pp. 233, 234, fig. 1; abs. in Texas Sta. Circ. 71 (1933), p. 19*).—The use of hot water treatment of sorghum flowers which kills the pollen without injuring other floral parts is explained, and the essential apparatus is illustrated.

Varieties of sorghum in Kansas, A. F. SWANSON and H. H. LAUDE (*Kansas Sta. Bul. 266 (1934), pp. 51, figs. 17*).—The sources of forage (sorgo), grain, and grass sorghums and broomcorn grown in Kansas and an agronomic classification with characteristics of the principal varieties which have been or are currently important are discussed, with remarks on the status, origin, terminology, adaptation, quality characters, and improvement of the crop. Results of variety tests at the station, substations, and outlying fields, in some places in cooperation with the U.S. Department of Agriculture, are re-

ported for different periods. For recommendations on growing the crop see earlier notes (E.S.R., 69, p. 514; 70, p. 770).

Varieties adapted to different parts of Kansas include Atlas, Kansas Orange, Standard Sumac, Early Sumac, and Leoti Red sorgo; Sunrise kafir for southwestern Kansas; grain sorghums including Standard and Western Blackhull, Red and Pink kafir, Dwarf Yellow milo, Wheatland (milo×kafir), and Standard feterita; Black Spanish (Black Jap) standard, and Scarborough dwarf broomcorn; Kansas Orange sorgo for sirup in eastern, southeastern, and south central Kansas, and Early Sumac and Leoti Red in western and northwestern Kansas. Sudan grass is the only grass sorghum grown.

A statistical analysis of yield factors in soybeans, J. H. WEATHERSPOON and J. B. WENTZ (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 524–531*).—The 237 soybean strains selected from the F_7 bulked progeny of an F_3 plant arising from Soysota × Ogemaw, under study at the Iowa Experiment Station, differed significantly in plant height, numbers of nodes per plant, of pods per node, and of seeds per pod, percentage of abortive seeds, weight of 100 seeds, and yield. Soil differences greatly influenced plant height, number of pods per node, size of seeds, and yield, number of nodes per plant to a less extent, and number of seeds per pod and percentage of abortive seeds very slightly. Significant simple correlations were found between yield and plant height, and numbers of nodes per plant, of pods per plant, and of pods per node. Seed size was correlated positively with percentage of abortive seeds and negatively correlated with plant height and numbers of nodes, of pods per node, and of pods, indicating that a physiological relationship probably is involved which would make combining large seed size with desirable expressions of these other characters very difficult. A multiple correlation coefficient of 0.5822 was found between yield and its estimate from the complex of factors height, numbers of nodes and of pods, percentage of abortive seeds, and weight of 100 seeds. Significant partial regression coefficients were given by height, pods, and weight of 100 seeds. Of the variation in yield between strains, 17 percent was accounted for by its regression on the factors plant height, numbers of pods per plant and of nodes per plant, percentage of abortive seeds, and seed size. Plant height and number of pods per plant were the most important characters in estimating yield.

Curing soy bean hay, H. L. DUNTON and C. R. MEGEE (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 254–257, fig. 1*).—Soybeans are ready for harvest during September, when the weather generally is rainy and furnishes ideal conditions for development of mold and for loss of the hay. Comparisons of seven methods of handling or curing soybeans in September 1931, typical for adverse weather conditions, showed that with favorable curing conditions the swath, windrow, and cock curing method would give a high quality hay, but with damp weather the results might be very poor. At the season when chances for rain were very high the McNaughton system (E.S.R., 56, p. 826) or rick method proved best if the soybeans contained much grass, and the binder method was best if the soybeans were free from grass. The method allowing the greatest exposure of the hay, i.e., hay cured in the swath or windrow, resulted in the lowest percentage of protein, while the rick, McNaughton, and binder cured hay had the highest content.

Varietal competition as a factor in yield trials with sugar beets, F. R. IMMER (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 259–261*).—When grown in alternate single-row plats by the U.S. Department of Agriculture, cooperating with the Minnesota Experiment Station, Old Type sugar beet seed yielded 3.78±0.44 tons more than Extreme Pioneer, while in alternate 4-row plats with only the central 2 rows harvested its increase over Extreme Pioneer was

only 1.78±0.31 tons. This effect was not evident in sucrose percentage or coefficients of apparent purity. Indications were that in variety trials with sugar beets involving varieties or brands differing markedly in size of plants, plats at least 3 rows wide should be used and at least 1 border row on each side of the plat discarded at harvest.

Influence of inbreeding and selection on seed production of space-isolated mother beets, H. L. KOHLS and E. E. DOWN (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 327–332, fig. 1*).—Data obtained with space-isolated mother beets (E.S.R., 63, p. 231) of strains used in the regular breeding program in 1930–32 at the Michigan Experiment Station, cooperative with the U.S. Department of Agriculture, indicated that inbreeding and selection of mother beets result, for a time at least, in an increase in the average production of seed per mother beet. Such increase may largely be the result of automatic elimination of self-sterile mother beets and the elimination of partly-sterile mother beets by selection.

Studies on sugar-cane and sugar-cane soils, I, II, P. E. TURNER (*Empire Jour. Expt. Agr., 2 (1934), Nos. 5, pp. 78–92, figs. 3; 6, pp. 103–118, figs. 3*).—Results of liming and fertilizer experiments with sugarcane are reported on from the Imperial College of Tropical Agriculture at Trinidad.

Part I. *The immediate and residual effects of lime on crop-yield.*—Plant- and ratoon-canes grown on unflocculated, acid soils benefited greatly by liming up to the soil's requirement. On soils exhausted by continued shifting cultivation (alternating sugarcane with bush), the benefit derived from liming was at first very small but attained normal proportions in time. Ammonium sulfate could influence significantly the effect of increasing quantities of lime; in its absence the lime-yield curve followed the law of diminishing returns while in its presence the curve rose to a maximum which was followed by a significant drop. Ultimate fall in yield seemed due to lack of balance in fertilizer treatments. The optimum dressing of lime for maximum yield did not appear to vary with weather conditions. Fluctuations in quality of cane due to liming ordinarily are unimportant in comparison with the accompanying increment in yield. Maximum yield of sugar per acre is obtained by liming up to the lime requirement for maximum yield of cane. The field experiments confirmed the validity of the method used for measuring lime requirement, based on the degree of unsaturation of the soil with exchangeable calcium.

Part II. *The immediate and residual effects of organic manures on crop yield: "Pen" manure in comparison with inorganic manures.*—Pen manure is composed of sugarcane trash, used as bedding for livestock, often supplemented by bagasse or factory waste products. The experiments showed that the effect of a single dressing of pen manure on yield can persist over four crops, and that the total residual effect on ratoon cane about equaled the immediate effect on plant canes. Although larger applications can further increase yield, about 15 tons per acre was most profitable. Hardy canes appeared to respond better than noble canes. Inorganic fertilizer also had a definite residual effect on yield, but it decreased faster than that of pen manure. The yield value of nitrogen in pen manure was definitely smaller than that of ammonium sulfate. Trials of pen manure plus inorganic fertilizer showed that ammonium sulfate could completely mask the increment in yield due to pen manure. A significant interaction could occur between pen manure and lime. Pen manure was inadequate as a source of potash. The results emphasized the fertilizer value rather than other attributes of pen manure. Sheep manure and fish manure also were compared with pen manure.

The manuring of sugar-cane, H. H. DODDS (*Empire Jour. Expt. Agr., 1 (1933), No. 4, pp. 368–380*).—This review of recent fertilizer research with

sugarcane, covering 30 references, deals with manure, filter cake, molasses, commercial fertilizers, and fertilizer practices in different countries.

Sugar cane variety report, 1933, C. B. GOUAUX and E. C. SIMON (*Louisiana Sta. Bul. 247 (1934), pp. 22*).—In continued (E.S.R., 63, p. 32) variety experiments with sugarcane grown on test fields in 9 localities in the sugarcane belt, results of 3 first and second stubble test fields on sandy loam in the Mississippi alluvium, first bottom soil section, showed that Co. 290, C.P. 807, and Co. 281 greatly exceeded the 4 P.O.J. canes during the 1933 season. As fall plant cane C.P. 28–19 and C.P. 28–11 surpassed the P.O.J. canes and Co. 281 at Cinclare.

In the Red River section C.P. 807 and Co. 281 gave best results as second stubble, Co. 290 and C.P. 807 as first stubble, and C.P. 28–11 and Co. 290 as fall plant cane. At the sirup test fields Co. 290 and C.P. 807 were outstanding, while C.P. 28–19 and C.P. 28–11 showed the highest sucrose tests as fall plant cane. In this northern area, more subject to early freezes, large plantings of C.P. 807 and Co. 290 seem too hazardous and P.O.J. 234 and Co. 281 the most profitable canes. In the Mississippi-Red River sediments area Co. 290, C.P. 807, and Co. 281 gave the best results as first and second stubble, greatly surpassing the P.O.J. canes, while as fall plant cane C.P. 28–11 led, being followed by C.P. 807 and Co. 290. In the Jeanerette section, as fall plant cane, C.P. 28–19, C.P. 28–11, C.P. 807, and Co. 290, in order, greatly exceeded the P.O.J. canes. On Mississippi alluvium, terrace soils on both Olivier and Lintonia silt loam, Co. 290 was outstanding as first stubble, fall plant, and spring plant cane. C.P. 807, Co. 281, and P.O.J. 36, in order, were the next ranking varieties. Available data and information indicate that both C.P. 28–19 and C.P. 28–11 are early maturing canes, compare favorably with P.O.J. 234 at any time in the season, and greatly exceed it in field tonnage. They also have given higher sucrose and field yields than the 4 P.O.J. canes and Co. 281, and from the past season's results both seem worthy of release for general field planting.

New varieties planted in comparison with released varieties at the Sugar Experiment Station were studied as to growth, disease and insect resistance, maturity, and production. In plant cane C.P. 28–11 and C.P. 28–19 compared favorably with P.O.J. 234 in sucrose content and maturity, while of the newer seedlings C.P. 29–291 compared favorably with C.P. 807 and P.O.J. 213, and C.P. 29–320 was earlier than P.O.J. 234, C.P. 28–11, or C.P. 28–19. Among first-year stubble C.P. 28–11 and C.P. 28–19 were early and high in sucrose, and C.P. 29–320 and C.P. 29–291 also showed early maturity. Co. 281 and Co. 290 were later and lower in sucrose content than P.O.J. 234 in both plant cane and first-year stubble. In second-year stubble C.P. 29–320 and C.P. 29–291 showed earliness, and both Co. 281 and Co. 290 were high in sucrose. In third-year stubble Co. 290 compared closely with Co. 281 in maturity and definitely surpassed C.P. 807, P.O.J. 213, and P.O.J. 36M. In plant cane and first-year stubble the definite superiority in tonnage of Co. 281, C.P. 28–11, and C.P. 28–19 over P.O.J. 234 was shown. Co. 290 and C.P. 807 also made high yields in plant cane and first- and second-year stubbles. The adaptations of the C.P. and Co. varieties discussed above are indicated. See also another note (E.S.R., 70, p. 328).

Determinative key for sugarcane varieties grown in Tucumán [trans. title], G. L. FAWCETT (*Rev. Indus. y Agr. Tucumán, 23 (1933), No. 5–6, pp. 87–98, figs. 2*).—About 90 varieties and selections are described and classified.

First year (1932–33) ripening tests with sugarcane × sorghum crosses, B. V. NATH, T. S. R. AYYAR, and T. VARAHALU (*Indian Jour. Agr. Sci., 4 (1934), No. 1, pp. 210–227*).—Reports of the first year's analyses of juices conducted in 1932–33 at several stations to test the maturity period of

certain sugarcane-sorghum hybrids (E.S.R., 68, p. 32) showed that the early or March-planted crop matured in 10 mo., with better quality of crop and juice than the June-planted crop which matured in from 8 to 9 mo. September plantings gave juices of still poorer quality. The sugarcane-sorghum hybrids tended to mature a little earlier than other sugarcane varieties, but like sugarcane their ripening is coincident with cooler months and lower humidity. The juices of the hybrids at the point of their maximum efficiency were decidedly richer than those of other Coimbatore canes. It appeared that certain of these sugarcane-sorghum hybrids can attain a purity of 85 and over in about 200 to 220 days after planting, and they tend to improve in quality for nearly 100 days afterward, possibly a distinct advantage in extending the milling season.

Use of the Zeiss sugar hand refractometer in sugar cane selection work, N. Craig (*Internatl. Sugar Jour., 36 (1934), No. 426, pp. 235, 236*).—In earlier work (E.S.R., 65, p. 36), chiefly with seedling varieties containing only noble blood, a very strong positive correlation was shown between the refractometric Brix (y) and the sucrose percentage (x) juice as determined by the saccharimeter. In subsequent work the canes consisted of varieties of widely different blood, the parents being noble canes, various nobilized glagah canes, Uba Marot, P.O.J. 213 and seedlings derived from it, and Uba types.

The results obtained by means of the sugar hand refractometer were reliable, even with seedlings of very mixed parentage. The linear function between these factors is expressed by the equation $y=0.97x+2.15$. A very strong positive correlation exists between the refractometric Brix and the density Brix, the latter averaging slightly higher than the former. The relationship between the density Brix and the sucrose percentage juice is a function of the form $x=ay^2+by+c$, between the limits, $x=13$ percent sucrose in the juice to $x=22$ percent sucrose, where $a=-0.075$, $b=+5.22$, and $c=-48.85$.

A further study of the relation of whole vs. cut roots to sprout production in the sweet potato, J. H. Beattie and R. C. Thompson (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 420–424*).—In continued studies (E.S.R., 68, p. 326), sprout production was observed in Puerto Rico sweetpotato roots, whole, cut into several pieces with and without proximal ends, and variously treated with chemicals, and also in a comparison of jumbos, No. 1, and string size sweetpotatoes bedded whole, with proximal ends removed, and cut into pieces. Dominance of the proximal over the distal end in production of plants can be broken by cutting sweetpotato roots into two or more about equal portions, each of which has a distinct proximal dominance in sprout growth. Cutting the sweetpotato was found to increase the number of plants but to reduce their size. Removal of the proximal tip only did not affect appreciably the dominance of the proximal end of the organ or the total number of plants produced. Under practical conditions in hot water heated hotbeds, small-sized seed stock produced the most plants. In the treatments employed, decay of cut sweetpotatoes was a serious factor which might more than offset any advantage obtained by cutting.

The Redfield tepary bean, an early maturing variety, S. Garver (*Jour. Amer. Soc. Agron., 26 (1934), No. 5, pp. 397–403, fig. 1*).—Redfield tepary bean, developed by the U.S. Department of Agriculture at Redfield, S.Dak., by mass selection from a Texas white variety (T.S. 3306) from 1914 to 1920, matures at least 2 weeks earlier and has nearly white seeds with a greenish cast. From 1920 to 1932, inclusive, Redfield averaged 17.2 bu. per acre, navy bean 6.2, Great Northern beans 8.2, and Mandarin soybeans 11.9 bu. The best comparative yields were obtained in seasons of extreme drought and heat, when teparies set seed under the most adverse conditions even when buds of navy and

Great Northern beans dropped off without setting seed. Despite unsuitable precipitation and other abnormal factors in most years, a quite direct relationship between seasonal precipitation and seed yields was apparent. Moderate temperatures and well distributed rainfall in July and early August were of greatest benefit to beans. Notes on pests and uses are included.

Relation of length of day to growth of timothy, M. W. Evans and H. A. Allard (*Jour. Agr. Res. [U.S.], 48 (1934), No. 7, pp. 571–586, figs. 10*).—Timothy plants propagated vegetatively from the original plant of each of 16 strains forming, when grown under natural conditions, a series with fairly uniform gradations from very early to very late were grown at Arlington, Va., under days artificially regulated to uniform lengths of 10, 12, 12.5, 13, 13.5, 14, 14.5, 15, 16, 17, and 18 hr. The plants produced vigorous vegetative growth under all lengths of day. The later that the plants of the different strains produced culms with inflorescences and florets in bloom when grown under natural conditions, the longer was the day required for normal development when the plants were grown under days of different uniform lengths. In timothy the earliness or lateness of different strains seems to be chiefly a matter of adjustment of the plants to the length of day.

Bright tobacco culture in the Coastal Plain of Georgia, J. M. Carr (*Georgia Coastal Plain Sta. Bul. 22 (1933), pp. 36, figs. 9*).—Superseding Bulletin 10 (E.S.R., 61, p. 136), this publication reports the continuation of variety and fertilizer tests with bright tobacco in cooperation with the U.S. Department of Agriculture and recommends practices in regard to soils, varieties, plant beds, cultivation, fertilizers, harvesting, curing, and insect control, and indicates the relation of rainfall to tobacco production.

Soils of the Coastal Plain area best suited to tobacco are the Norfolk sandy loams and loamy sands and the light phases of the Tifton sandy loams. Varieties best suited are those of the light type group including Jamaica, Cash, Bonanza, and Yellow Pryor. Practices advised are sterilizing plant beds by steam or burning or providing new beds on virgin soil, liberal treatment with tobacco fertilizers, planting 1 well-rounded tablespoon of seed per 100 sq. yd. of bed in late December or early January, transplanting in late March or early April plants 2 ft. apart in 4-ft. rows, and frequent cultivation, with no delay in topping and suckering.

Tobacco fertilizer should contain about 8 percent of phosphorus, supplied by superphosphate, where applications of 1,000 lb. or more of mixture are used per acre; 3 to 4 percent ammonia, one-half derived from high-grade organic materials and one-half from sodium nitrate, or about one-fourth from sodium nitrate and the remainder from other nitrates or from urea; and from 5 to 8 percent of potash including 40 lb. per ton from high-grade chloride and the remainder from potassium sulfate or potassium-magnesium sulfate. Horse manure as the sole or a partial source of nitrogen has given excellent results. No particular advantage came from close spacing in conjunction with heavy fertilization. On most soils 1,000 to 1,200 lb. of fertilizer per acre seemed enough, yet occasionally on very light sandy soils 1,600 lb. could be applied profitably.

Cultural practices in winter wheat production, T. A. Kiesselbach, A. Anderson, and W. E. Lyness (*Nebraska Sta. Bul. 286 (1934), pp. 28*).—Various methods of seedbed preparation, tillage, seed treatment, planting, and harvesting for winter wheat were studied in continuation of earlier work (E.S.R., 55, p. 135; 58, p. 637).

Plowing 7 in. deep on July 15, August 15, and September 15 without supplemental disking resulted in respective 11-yr. (1922–32) average yields of 27.2, 29.6, and 20 bu. per acre and with disking 33.9, 31, and 28.9 bu. Without

supplementary weed control, August 15 plowing proved better than earlier or later plowing. September plowing resulted in 10 percent less stand, reduced stooling, and about two-thirds as many spikes per unit area as July plowing. Substantial increases in yield followed disking supplementary to July 15 and September 15 plowings and a smaller increase with August 15 plowing, probably because of limited weed growth on the August plowed land. Land disked July 15 and August 15 and plowed September 15 yielded 28.9 bu. and land disked on those three dates, 26.6 bu. Listing July 15 with ridges split August 15 and disked September 15 yielded 30.6 bu., seeding between rows of standing corn 21.2 bu., and planting on disked corn stubble 23.5 bu. The effects of methods of seedbed preparation on the proportion of grain to straw, plant development, protein content of grain, development of soil nitrates, and on soil moisture content are discussed.

Fanning-mill and size-of-seed studies indicate that small seed is less productive than large seed when planted to permit maximum plant development or at a seeding rate optimum for the large seed, but the difference was not very significant when both seed sizes are planted at their respective optimum rates. The large and heavy grades had little or no advantage over ungraded seed.

A high inverse correlation was found between percentage of bunt-infected heads and the grain yield per acre. During 9 yr., when smutted heads ranged from 1 to 43 percent, yields were reduced about 1 percent for each 1 percent of infection. When nearly smut-free, medium-infected, and heavily-infected seed were treated during 8 yr. with formaldehyde (1 pt.-to-40-gal. water solution), almost perfect control of smut was obtained but yields were reduced 5 to 8 percent below that from untreated, nearly smut-free seed because of lower germination and retarded growth. Similar seed lots treated with 20 percent copper carbonate (2 oz. per bushel) failed to give perfect control of smut, with the medium and the heavily infected seed resulting in similar reductions in yield.

Planting experiments showed broadcasting to yield 17 percent below drilling and 4-in. drills to yield slightly less than 7-in. drills. Furrow drilling in 14-in. rows yielded 81 and 91 percent as much as 7- and 14-in. surface drills, respectively. A 5-pk. rate seemed most practical in eastern Nebraska. Higher average yields came from October 1 plantings at the 5-pk. rate. The plantings on September 15 and 23 were at a decided disadvantage during 5 yr. of heavy Hessian fly infestation, whereas during the four fly-free years the optimum planting period was from September 15 to October 1. Parallel plantings at a 7-pk. rate resulted in somewhat higher yields at all dates with a tendency for a greater increase at later dates. Rolling and harrowing wheat in early spring did not affect yields significantly.

Wheat harvested at about the early dough, late dough, ripe (satisfactory for binding), and dead ripe (satisfactory for combining) stages yielded 20.6, 26.9, 30.6, and 29.1 bu. per acre, respectively, and the moisture content of the grain at these four respective stages, which averaged 6 days apart, was 50, 43, 25, and 12 percent.

The rate of seeding of wheat in relation to variety trials, A. W. Hudson and W. C. Stafford (*Empire Jour. Expt. Agr., 2 (1934), No. 5, pp. 29–39*).—A series of experiments using Solid Straw Tuscan, Hunter, and Marquis wheat, each differing in growth habit, was conducted near Canterbury, New Zealand, in three years to test the theory that the seeding rate may exceed the optimum by a reasonable quantity (20–40 lb. per acre) without the yield and quality of the grain differing appreciably from those resulting from optimum seeding.

Where rates exceeded the optimum, no appreciable differences therefrom occurred in yield, weight of grain, bushel-weight, and commercial value of

grain. Size of kernels was no guide to seeding rate. Indications were that in variety trials all varieties should be sown at the same rate in pounds per acre, and that the seeding rate should be from 30 to 40 lb. per acre greater than the estimated optimum for the control variety. Error may be obtained by adjusting seeding rates to provide equal numbers of seeds per unit area.

Differential varietal responses of winter wheat to time of planting, C. A. SUNESON and T. A. KIESSELBACH (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 294–296*).—The pronounced differential varietal responses to time of planting in the advanced winter wheat nursery at the Nebraska Experiment Station under conditions of Hessian fly prevalence and winter-killing, and other factors, suggested that the introduction of duplicate plantings at several dates may be a valuable adjunct in the technic of advanced testing.

The effect of nitrogenous fertilizers on the growth and yield of wheat and barley in South Australia.—Part II, The effect of a previous crop in the response of wheat to nitrogenous fertilizers, and the effect of increasing amounts of nitrogen on barley, A. E. V. RICHARDSON and H. C. GURNEY (*Empire Jour. Expt. Agr., 1 (1933), No. 4, pp. 325–332, fig. 1*).—This is the second part of the series (E.S.R., 70, p. 764).

Wheat grown in rotation with (1) bare fallow, (2) wheat, (3) barley, (4) oats, and (5) peas, without fertilizer or with 2 cwt. superphosphate and 1 cwt. ammonium sulfate per acre, made its highest yields after bare fallow or after peas. Wheat after oats gave significantly higher returns than that after barley or wheat. Superphosphate was most effective with wheat after bare fallow, the mean yield being increased by 19.5 bu. per acre for the three years. The response to superphosphate was significantly higher after peas than after cereals, but less than after fallow. The supplementary dressing of 1 cwt. of ammonium sulfate per acre gave no significant increase with wheat after bare fallow, but gave a substantial response after wheat, barley, or oats, ranging from 6.5 to 7.7 bu. per acre. Wheat after peas still needed nitrogen, although the previous pea crop presumably added organic nitrogen to the soil, and a mean increase of 6.1 bu. per acre was obtained.

Barley responded markedly to ammonium sulfate for all applications from 14 to 425 lb. per acre. A quantitative relation was observed between the amount of fertilizer applied and barley yield. When adequate quantities of soluble phosphate are applied, nitrogen becomes a limiting factor, and increments in yield of total produce and grain decrease with each successive addition of ammonium sulfate in accordance with the law of diminishing returns. The percentage of nitrogen in the grain was practically unaltered for treatments ranging from 0 to 56 lb. of ammonium sulfate. Applications of 1 cwt. per acre slightly increased the nitrogen percentage, but with heavier dressings a material increase in nitrogen content was observed and the quality of the grain for malting purposes was reduced. Census studies showed that the mean effect of nitrogenous fertilizers on barley was to increase the number of spike-bearing tillers per plant.

The quality of wheat as influenced by environment, F. T. SHUTT and S. N. HAMILTON (*Empire Jour. Expt. Agr., 2 (1934), No. 6, pp. 119–138*).—An investigation to determine the influence of seasonal and soil conditions on the protein content of wheat, conducted from 1905 to 1932 on a number of experimental stations throughout Canada, demonstrated that, in general, the excellent quality of the wheat of the prairie provinces is due very largely to favorable seasonal conditions, which include high temperatures and absence of excessive moisture, resulting in the drying-out of the soil during the latter stages of the development of the grain. For the production of high-quality wheat the economic value of these conditions is fully equal in importance

to that of desirable inherited characteristics, e.g., quality of gluten and earliness in ripening, and an exceedingly fertile soil.

Observer's bias in sampling-observations on wheat, F. YATES and D. J. WATSON (*Empire Jour. Expt. Agr., 2 (1934), No. 6, pp. 174–177*).—Results are reported from an experiment at Rothamsted to determine to what extent counts on tillering by various observers differed from one another, and how far this difference was constant for a given observer and in the nature of a bias.

Experiments with yams in Trinidad, 1931–33, R. C. WOOD (*Empire Jour. Expt. Agr., 1 (1933), No. 4, pp. 316–324*).—Variety, cultural, fertilizer, and mulching experiments with *Dioscorea* spp. are reported from the Imperial College of Tropical Agriculture. Lisbon was the best of the *D. alata* varieties, while Chinese, a variety of *D. esculenta*, proved a heavy yielder and easy to cultivate, but did not meet the popular taste. A variety of *D. cayenensis* is good in quality but difficult to harvest. Increased yields were obtained from closer planting in the row, but not from reducing the distances between the rows. Planting in dry weather possessed no advantage in Trinidad. If practiced there was no need to protect the young set by a mulch of trash or grass, as is desirable in West Africa. Partially decomposed vegetable matter, such as compost, increased the yield, but additions of raw organic matter may have little effect.

Renovation of an old lawn, F. A. WELTON and J. C. CARROLL (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 486–491, figs. 4*).—A lawn area at the Ohio Experiment Station badly infested with dandelions received on different series of plats sodium chlorate solutions ranging from 8 to 24 percent in strength late in September, October, November, December, January, and February, and in March the plats were fertilized and reseeded with a simple lawn mixture.

Conclusions were that sodium chlorate applied in fall or winter will kill practically all common lawn weeds, including dandelions, buckhorn, broadleaved plantain, yarrow, and sorrel. Sodium chlorate 1 lb. per gallon of water (12 percent) applied to 100 sq. ft. usually suffices, but with unfavorable climatic and soil conditions, especially where sandstone comes close to the surface, the solution should be increased in strength to 1.5 or even 2 lb. per gallon. The applications should be made before January 1 or about 3 mo. before reseeding. An old lawn can be renovated by this procedure without spading or plowing up, but this plan is recommended only where the grass is not worth saving.

Leafy spurge, H. C. HANSON (*North Dakota Sta. Circ. 55 (1934), pp. 4, figs. 2*).—Practical information is given on the characteristics of leafy spurge (E.S.R., 69, p. 364) and on its control in small patches by sodium chlorate and by cultivation on large areas.

HORTICULTURE

The absorption and evaporation of moisture from plant containers, L. H. JONES (*Jour. Agr. Res. [U.S.], 48 (1934), No. 6, pp. 511–516, fig. 1*).—Further studies (E. S. R., 66, p. 538) at the Massachusetts Experiment Station showed that water relations, water movement, and root distribution are entirely dependent on the structure of the plant container. In a nonporous pot with a ramifying root system and lack of lateral movement of water it was comparatively easy to maintain an even distribution of moisture in the soil. Under conditions comparable to those commonly prevailing in commercial enterprises nearly one-fourth of the water applied was lost through the walls of porous flower pots within 1.5 hr. In fact twice as much water was evaporated from the wall as from the soil surface, indicating a strong lateral move-

ment of moisture. However, when the pot was placed on a moist surface a considerable proportion of the lost water was replaced. Cement pots did not have as large a water-holding capacity as those made of clay. The distribution of roots was affected by the character of the pot; for example, in a nonporous container the roots penetrated the entire soil mass, whereas in a porous vessel they were largely located between the soil and the pot.

Influence of a gaseous product from apples on the germination of seeds, A. J. M. SMITH and R. GANE (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 156–158, pls. 5, fig. 1*).—Vapor from ripe apples passed over germinating garden pea seeds almost completely inhibited development in high concentrations, but upon removal of the seedlings from the influence of the vapor normal growth was resumed. The inhibiting substance was not removed or reduced below the point of toxicity by caustic soda, alkaline permanganate, iodine, and certain other chemicals. Complete combustion over copper oxide removed the active constituent, as did also bromide, ozone, and fuming nitric and fuming sulfuric acids. The results bear out the assumption that it is ethylene given off by mature apples that is the causal factor.

[Horticulture at the Alabama Station] (*Alabama Sta. Rpt. 1932, pp. 25–27*).—Brief reports are presented on the results of fertilizer experiments with strawberries, by R. W. Taylor; variety tests with beans, cabbage, and peas, by C. L. Isbell; the effects of certain organic materials on the nitrate levels of the soil with the object of applying the results to the problem of increasing cold resistance of Satsuma trees by discouraging late activity of the trees in fall and winter through the lowering of the nitrate content of the soil, by E. W. McElwee; and the influence of different fertilizer treatments and seasonal conditions on the characteristics, composition, and properties of the strawberry fruit, by L. M. Ware.

[Horticulture at the Delaware Station] (*Delaware Sta. Bul. 188 (1934), pp. 33–35*).—In this progress report (E.S.R., 69, p. 48) there are presented brief summaries of investigations dealing with the physiological dropping of fruits, premature flower stalk formation in cabbage, and strain tests with cabbage, all by L. R. Detjen and L. H. Strubinger; the relative effect of different nitrogen fertilizers on peaches, by Strubinger, C. A. McCue, and Detjen; and the effect of nitrogen on the growth, yield, and carbohydrate-nitrogen relationships in Jonathan apple trees, by F. S. Lagassé.

[Horticulture at the Maryland Station] (*Maryland Sta. Rpt. 1933, pp. XIX–XXI, XXII, XXIII–XXV*).—Brief reference is made to progress of studies on the breeding and selective improvement of sweet corn, fertilizer requirements of canning corn, breeding of peas resistant to wilt disease, the effect of fertilizers on the quality of tomatoes, means of influencing the biennial fruiting habit in the apple, color development in apple fruits, effects of thinning grape clusters on yield, planting distances for peaches, and the propagation of rootstocks for fruit trees.

The subsistence garden for the Coastal Plain of Georgia, O. WOODARD (*Georgia Coastal Plain Sta. Circ. 5 (1934), pp. 13*).—Herein is presented general information on the planning, planting, selection of varieties, and general cultural care.

A study of some ecological factors influencing seed-stalk development in beets (Beta vulgaris L.), E. CHROBOCZEK (*[New York] Cornell Sta. Mem. 154 (1934), pp. 84, figs. 27*).—Stating that garden beets started in the greenhouse, hotbed, or coldframe often shoot to seed prematurely, a study was made of the interrelation of temperature and light to this phenomenon. Using

chiefly the Crosby Egyptian variety, plants were grown in the greenhouse in four different ranges of temperature and with the photoperiod modified by supplemental light and black cloth. In field studies the plants were first subjected to differential temperatures in the greenhouse or coldframe. Beets grown at from 50° to 60° F. developed 100 percent of seed stalks in the first year, whereas at a high continuous-growing temperature all the plants continued in a vegetative condition. Germination at a low temperature did not induce early flowering in beets later grown in a warm environment.

As to photoperiod effects, plants in a cool house developed seed stalks under an 8-hour day, but a combination of low temperature and a long photoperiod (15 hr. or more) was more effective in the production of large plants and a high yield of seed. Thus by regulating temperature and the photoperiod the time required for seed stalk formation in the beet was greatly modified; in fact certain plants held at a temperature above 60° continued in a flowerless condition for 3.5 yr. By transferring seeding plants from a high to a low temperature the vegetative condition was restored.

Beets started in the greenhouse in early spring but given 30 days' treatment in coldframes with an average temperature of about 50° developed 15.69 percent of seed stalks by August 16 of the same year as compared with 0.77 percent for the same stock held in a warm house until set in the field. By circulating cold water about the crowns of the plants premature seeding was induced, indicating a localization of the controlling influence in the actively growing portion.

Histological studies of the growing points of beets taken from the different temperatures showed that in plants remaining in a vegetative condition the ratio of diameter to height of the apexes was 4.4 as compared with 2.04 and 2.05 in plants which later went to seed. Under favorable temperature and light conditions plants in a favorable nutrient and moisture situation were more inclined to shoot to seed prematurely than were those under unfavorable conditions.

Aeration and growth of canteloup seedlings (Cucumis melo), R. PEARL, T. I. EDWARDS and A. A. and C. P. WINSOR (*Amer. Jour. Bot., 21 (1934), No. 5, pp. 242–250, figs. 4*).—At Johns Hopkins University seedlings of *C. melo* grown under aseptic conditions in the dark without an external nutrient supply showed a diminished growth rate, a lower final height of the hypocotyl, and a less efficient metabolic translocation of the food materials from the cotyledons to the growing plant as the ventilation of the tubes in which they were grown was progressively less adequate. The mean duration of life of the seedlings increased as the ventilation was made progressively poorer.

Artificial manure for mushroom production, S. A. WAKSMAN and C. A. RENEGER (*Mycologia, 26 (1934), No. 1, pp. 38–45, fig. 1*).—In a further report (E.S.R., 70, p. 476) studies at the New Jersey Experiment Stations of four composts, (1) horse manure with bedding, (2) wheat straw 60 percent and tobacco stems 40 percent, (3) wheat straw 60 percent and alfalfa hay 40 percent, and (4) wheat straw 70 percent and tobacco stems 30 percent, and with ammonium phosphates added to the three straw lots, the greatest loss of organic matter after 44 days of composting was shown in lot 3 and the lowest in lot 4. As a result of the decomposition there was a decrease in water-soluble substances, fats, waxes, and carbohydrates, accompanied by a rise in mineral protein, and lignin constituents. When planted with mushroom spawn the best growth was secured on the alfalfa-straw compost, but higher yields were obtained on the horse manure and straw plus tobacco stems composts.

Distribution of oxygen and carbon dioxide in mushroom compost heap as affecting microbial thermogenesis, acidity, and moisture therein, E. B.

LAMBERT and A. C. DAVIS (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 7, pp. 587–601, figs. 13*).—In an attempt to improve composting practices, analyses were made of gas samples taken from various parts of mushroom compost heaps at Arlington Experiment Farm, Va. The results showed an increase in carbon dioxide and a decrease in oxygen toward the lower central portion of the heap. In flat heaps 3 ft. in depth anaerobic conditions were usually found deeper than 1 ft. and more than 3 ft. from the sides. In the ordinary commercial compost heap much of the manure is believed to be under anaerobic conditions but the harmful effects are offset in part by the frequent turning commonly practiced. Compost in the anaerobic portion of the heap tended to be acid, while the well aerated portion was neutral or alkaline. Except for the extreme outer layers cooled by the surrounding air, the highest temperatures were usually found in the better aerated portions of the heap. At the ground level temperatures of 100° to 120° F. often exist, due apparently to a lack of oxygen. The authors suggest that tiles might be placed under the pile to introduce oxygen. An aerated condition in the compost heap is conceded preferable to an anaerobic condition, provided such can be secured without excessive heating or drying.

Relation of nitrate nitrogen to the carbohydrate and nitrogen content of onions, A. L. WILSON ([*New York*] *Cornell Sta. Mem. 156* (*1934*), *pp. 30, figs. 2*).—Records taken on Ebenezer onion plants growing in sand in pots and in boxes of soil indicated that applications of nitrate nitrogen beyond the necessary requirements of the plants have no value. In soil excessive quantities of nitrates tended to depress yields of bulbs without affecting production of tops. Since the same depression did not occur in sand cultures, the author suggests that in the soil, which contained considerable amounts of undecomposed organic matter, the application of nitrate of soda may have increased the activity of soil microflora, with a consequent temporary deficiency of available nitrogen.

Externally, nitrogen starvation in onions was manifested in stunted growth, pale green or even yellow leaves, rigidly erect position of the leaves, and the failure of roots to die as early as in normal plants. Internally, nitrogen deficiency was shown in a lower content of both soluble and insoluble nitrogen in all parts of the plant. There was no accumulation of carbohydrates, although the ratio between total sugar and soluble nitrogen was greater than in well-nourished plants. Apparently sugar content did not undergo much variation in response to the different levels of nitrates in the soil. That variety is a factor in sugar storage was shown in a high content of reducing sugar in Sweet Spanish and of nonreducing sugars in Ebenezer. Apparently initial bulbing results from an accumulation of sugars, as accretions of this material were observed in all portions of the plants just preceding bulb development. Later on the sugar content of leaves and necks decreased, while that of the bulbs increased steadily. Soluble nitrogen increased in the bulbs and remained uniformly constant in the neck and leaves, indicating that the cessation of vigorous vegetative growth is not attributable to a deficiency of soluble nitrogen.

This is part 2 (E.S.R., 69, p. 366) of a doctorate thesis.

Chemical composition and yield of the Alaska pea as influenced by certain fertilizers and by the stage of development, S. L. JODIDI and V. R. BOSWELL (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 8, pp. 703–736*).—Observations upon Alaska peas grown at Arlington Experiment Farm, Va., under different fertilizer treatments showed that muriate of potash and superphosphate applied singly are apparently without consistent or significant effects on the rate of development or upon quality. Readily available nitrogen on the other hand

tended to delay maturity appreciably, as shown in a higher sugar and lower protein and hydrolyzable polysaccharide content.

Analyses of peas from the various plats showed the nitrogen-treated peas on an average for the entire season to have a somewhat higher percentage content of reducing sugars, a significantly higher percentage of sucrose, and a distinctly lower starch content, as compared with peas from the unfertilized plat. Peas grown on the potash- and phosphorus-treated plats showed a larger proportion of protein than the check, suggesting a more advanced or hastened maturity. Phosphorus application was followed by no noticeable difference in percentage of any of the carbohydrates, ash, or ether extract, indicating that maturity and hence the quality was not affected. Peas from the potash plats showed slightly and significantly higher ash and ether extract than did the checks or any other lot. It appeared, therefore, that potash did have a slight tendency to hasten maturity.

The effects of increasing the iodine content of the tomato plant on respiration and enzymatic activity, F. L. Wynd (*Ann. Missouri Bot. Gard., 21 (1934), No. 2, pp. 367-432, pl. 1, figs. 29*).—At Washington University, St. Louis, the application of potassium iodide in sufficient quantity to provide 1, 5, 10, and 20 p.p.m. in addition to a general nutrient solution exerted a depressing effect on the growth of Bonny Best tomato plants growing in water cultures. The harmful effects were manifested in a loss of green color and a progressive dropping of the lower leaves. Respiration, peroxidase, and invertase were decreased by the lowest concentration of potassium iodide but greatly increased at the higher concentrations. These increases did not, however, parallel the degree of iodine injury. The underlying physiological reactions are discussed.

Effects of spacing on greenhouse tomatoes, H. L. Seaton (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 284-290, fig. 1*).—Records taken on greenhouse-grown Grand Rapids Forcing tomatoes planted 14, 21, 28, and 42 in. apart in rows spaced uniformly showed that the number of fruits and yield per plant were increased in direct proportion to the increase in planting distance. However, the lowest total yield per unit of area resulted in the widest spacing and the maximum from the 28-in. spacing. Size of fruits, number of flowers, and percentage of those setting and maturing fruit increased with the wider spacings. Little or no difference was observed in the several lots in the number of days from blooming to maturity.

Low-temperature tolerance of summer- and autumn-grown hot-house tomatoes, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 82, 83*).—In greenhouse-grown Potentate tomatoes harvested in the height of summer, wastage began after about 18 days at 64.5° F. and reached 50 percent after 30 days. There was no wastage in similar fruit stored at 41° in 30 days. On the other hand autumn-harvested tomatoes of the same variety developed watery blisters filled with *Botrytis* in 10 days at 41°. An interesting problem was raised in the different behavior of the summer- and autumn-harvested fruits.

Gas-storage of tomatoes, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 209, 211*).—Potentate tomatoes packed June 28 when in the yellow and tinted stages of maturity and stored under various controlled temperature and atmospheric conditions kept best in the vicinity of 12° C. (53.6° F.) Red coloration was retarded both by a decrease in the concentration of oxygen and by the presence of carbon dioxide. The ideal storage temperature appeared to be 12°, with an atmosphere containing 5 percent oxygen and 5 percent carbon dioxide.

Effects of ethylene and of apple vapours on the ripening of fruits, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest.*

Bd. Rpt., 1932, pp. 55–58, fig. 1).—Using as a biological indicator the sprouting of the shoots and roots of peas and mustard seeds, it was observed that in apples held at 18° and 20° C. the development of toxic substances in the surrounding vapor coincided with the climacteric rise. Vapor from postclimacteric apples when passed over other fruits had the same effect as ethylene. Green bananas and tomatoes when exposed to vapor from ripe apples ripened more rapidly than did controls. Also the vapor of ripe bananas hastened the maturity of green bananas. It was found that from 2 to 7 percent of the carbon loss of ripening apples is in the form of volatile gases other than carbon dioxide. It is pointed out that the effect of ripe fruit in hastening maturity of unripe fruit may have wide commercial significance.

Arsenic injury of apples, F. L. Overley and E. L. Overholser (*Washington Sta. Pop. Bul. 149 (1934), pp. 20, figs. 11*).—Soluble arsenic was the chief cause of calyx end injury of Washington apples in 1933. Blackened or brown depressed areas were produced. Similar injury often occurred at the stem end or around the lenticels and occasionally on the sides of the fruit.

In 1933 the unadvised addition of white arsenic to the codling moth sprays resulted in a large amount of calyx end injury, appearing sometimes before and sometimes after washing.

Foliage injury was found in 5 years' experiments at Wenatchee, especially where certain brands of lead arsenate were used under rather humid conditions. Where certain mineral oils were combined with certain brands of lead arsenate more fruit burning was produced than with other brands. Lime or spreader or fish oil added to lead arsenate sprays inhibited or reduced such injury.

Where fluorine compounds were employed, the use of a hydrochloric acid wash produced more injury than the use of alkali washes. The use of sodium silicate ahead of the acid and followed by a thorough rinse is therefore advised by the authors for tandem washers. It is advised that no material containing lime be used with barium fluosilicate.

Arsenic injury was found to be favored by factors affecting the skin texture of the fruit, such as growing conditions inducing drought spot, sunburn, growth cracks or off type form, injuries to leaves or calyx ends of the fruit by rosy aphids or mites, and premature leaf drop.

Presence of moisture on the fruit almost always increased the injury. Less effective washing programs are more likely to result in injury with certain types of spray coverings than the more effective methods, particularly when using sodium silicate, although this material, properly used, proved superior to HCl in removing difficult spray residues. Both acid and alkali solvents, however, when used at too high concentrations or with insufficient rinsing, may produce injuries which can be distinguished from arsenic injury. Too long immersion, especially at too high temperatures, was found likely to increase arsenical injury especially with tender-skinned, early harvested varieties before sufficient natural wax has developed.

The use of long-bristle brushes in the rinsing section of the washing machine and the frequent renewal of the washing solution are advised. A warm water rinse was found to remove alkali solutions and spray residues better than cold water and to result in less skin cracking following a heated wash.

Frozen fruits and vegetables, T. N. Morris and J. Barker (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 92–94*).—Gooseberries, black currants, and red currants stored for 3.5 mo. at −10° and −20° C. kept equally well at both temperatures. Morello cherries kept well at −10° but deteriorated shortly after thawing. Strawberries frozen at −45° had on thawing a marked superiority in color, flavor, and appearance over fruit frozen at −20° and −10°, but the advantage soon disappeared after removal from

low temperature. A 50 percent sirup was found better than weaker concentrations for strawberries. Peas frozen in the blanching liquid retained their appearance and flavor better than those frozen dry. Unblanched peas frozen at —45° were of excellent appearance but not equal in flavor to the blanched lots. Peas carefully shelled by hand kept better than those bruised in the shelling machine.

Progress report on fruit breeding, G. T. SPINKS (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1932, pp. 19–23*).—Brief descriptions are presented of certain new varieties of apples, pears, plums, black currants, and blackberries distributed by the station during the year

Water conductivity in the apple tree as affected by pruning and drought, C. E. BAKER (*Abs. Thesis, Univ. Ill., Urbana, 1933, pp. 18*).—Studies in a Grimes Golden and Jonathan orchard at Olney, Ill., in the variety orchards at Urbana, and with small greenhouse-grown trees showed that in older trees large pruning wounds result in desiccation and heartwood formation. Under the usual conditions the water content of the wood of the apple tree remains almost constant. At Olney where a 25 percent loss of trees was experienced in the first 12 and 13 yr. after planting the author believes that the rapid heartwood formation in years of extreme drought may suddenly limit the water available to the foliage if the succeeding years are unfavorable to rapid formation of new wood. The special soil environment of the individual tree is also a contributing factor.

Withholding water from the greenhouse trees resulted in every case in reducing the average water conductivity of the stems significantly below that of comparable well-watered trees. The vessels in the wood of all 3 years' growth were found plugged, the greatest reduction being in the current season tissues. In the experiment a 10 percent reduction in the water content of the wood caused serious plugging and browning below the pruning cuts and in the unpruned stems.

Colour strains of the Delicious apple, C. C. STRACHAN (*Sci. Agr., 14 (1934), No. 7, pp. 384–399, figs. 3; Fr. abs., p. 406*).—Having available four distinct red sports of Delicious, all discovered in the Okanagan Valley, a careful study was made at the Summerland, B.C., Dominion Experimental Station of possible physical or chemical differences between the strains and the ordinary Delicious when all were grown and handled under the same conditions. The results of pressure tests, pH, conductivity, tannin, and nitrogen determinations, titration curves, and respiration and evaporation loss tests showed no significant variation between the several strains. Fruits ripening on comparable trees developed sugar at practically the same rate and in equal quantities irrespective of strain. Flesh color proved a reliable index to maturity, yellow flesh being correlated with higher sugar. Tree growth characteristics were similar in all the strains, but there were discovered sharp differences in congeniality between the red and striped strains on a single clonal rootstock.

Ammonium and nitrate nutrition of dormant Delicious apple trees at 48° F, G. T. NIGHTINGALE (*Bot. Gaz., 95 (1934), No. 3, pp. 437–452*).—In these studies, conducted cooperatively by the New Jersey Experiment Stations and the University of Chicago, young Delicious apple trees on seedling roots growing in darkness in both quartz sand and water cultures made more effective use at 48° of ammonium sulfate than of calcium nitrate. The trees receiving ammonium sulfate synthesized amino acids and asparagine more rapidly than did the calcium nitrate treated trees. In all the nitrogen-supplied trees simple proteins were synthesized, and apparently accumulated exclusively in the fine fibrous roots. No nitrate or nitrite was detected in the roots of the ammonium-supplied trees at any time. After 8 days starch was practically absent in the

fine roots of the ammonium series, whereas at the same time there was an abundance in the comparable roots of the nitrate series but not to the extent observed in a no-nitrogen lot. There was a noticeable decrease, particularly in the ammonium series, of starch in the large roots of all the trees near the point of attachment of the new lateral roots.

At the surface of the fine absorbing roots pHs of 4.2 and 5.6 were recorded in the ammonium and nitrate sand series, respectively. In the water cultures the changes in pH were in the same direction but less marked. The pH of comparable internal tissues was essentially the same in all the nutrient solutions and did not vary with that of the solution itself. Mature xylem had a pH of 4.8 to 5.2, phloem and cambium (except the phloem rays) 5.6 to 5.8, and the cortical cells of the fine fibrous roots ranged from 4.4 to 5.2. A limited examination of old roots and tops also indicated that starch-storing cells are relatively acid, and that the actively growing tissues, such as cambium, are comparatively alkaline. During the 16-day period of the experiment buds expanded only slightly, but there was a vigorous development of roots in both the sand and water cultures.

Effects of temperature on the growth and composition of Stayman and Baldwin apple trees, G. T. NIGHTINGALE and M. A. BLAKE (*New Jersey Stas. Bul. 566 (1934), pp. 20*).—Observations on small apple trees of the Baldwin and Stayman Winesap varieties grown under conditions of high and low nitrogen in chambers with an equal relative humidity of 80 percent but with differing constant temperatures of 45°, 70°, and 95° F. showed distinct varietal responses. At 45° Baldwin grew much more than Stayman Winesap, had greener foliage, and translocated the organic products of nitrate reduction to the tops so that stems and leaves increased in volume. In Stayman Winesap organic nitrogen accumulated in high concentration in the fine roots, and little, if any, was translocated.

At the other extreme (95°) the Stayman Winesap functioned more efficiently than the Baldwin, maintaining a fairly dark green color and continuing its growth. At the same time Baldwin made practically no growth and lost some of the lower leaves, especially with added nitrates. Both varieties showed a decrease in carbohydrates at 95°, indicating that respiration proceeded more rapidly than photosynthesis. Baldwin roots showed internal injury, no new roots were produced, and there was little, if any, reduction in nitrates. None of these symptoms were evident in Stayman Winesap. In Baldwin the old wood and old storage roots contained much starch that was not translocated to the fine roots or new growth.

At 70° both Baldwin and Stayman Winesap grew satisfactorily, and hence these roots were used as standards for comparison. The relationship of the experimental results to the known adaptation of the Baldwin to northern latitudes and of Stayman Winesap to southern latitudes is discussed.

Chemical work on fruit, D. HAYNES (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 273–279*).—Using halves of the same apples, comparisons were made of the loss of respirable material with the output of carbon dioxide in the Worcester Pearmain and Bramley Seedling varieties. In Worcester Pearmain the mean loss of sugar was found to be very nearly the equivalent of the evolved carbon dioxide, but in Bramley Seedling the mean loss of sugar was relatively greater. Analyzed statistically there was found a high order of probability that the difference between the carbon content of the sugar lost and that of the output of carbon dioxide by the apples should be attributed to chance in the Worcester Pearmain series and to some real difference in metabolism in Bramley Seedling. Unequal coloring

on the two halves of Worcester Pearmain apples with a consequent unequal distribution of sugar presented a conflicting variable in this variety.

Biochemical study of senescence in apples, M. Onslow, F. Kidd, and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 70–75, figs. 3*).—At the time of harvest Bramley Seedling apples from ringed trees differed chiefly from the fruits of nonringed trees in a higher carbohydrate content, principally starch and cane sugar. Fruits from the ringed trees had a higher respiratory activity and kept for a shorter time than did the unringed fruit. During the first stage of storage, when starch was being hydrolyzed, sucrose rose to a greater extent in the fruit from the unringed than from the ringed trees. In the starch-free stage fructose tended to remain constant, while glucose continued to rise, the loss of sugar corresponded to that calculated from the production of carbon dioxide, acid was being consumed, and the consumption of sugar in respiration was equivalent to approximately half the production of hexoses by hydrolysis from sucrose. An increase in the rate of acid loss accompanied the onset of breakdown in both lots of fruits. The theory is advanced that the susceptibility to breakdown is associated either with a failure of the cell's mechanism to convert glucose into fructose or with the absence of any mechanism in the cell for the glycolysis and respiration of glucose.

Changes in the nitrogen of Bramley's Seedling apples during cold-storage, A. C. Hulme ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 75–79, fig. 1*).—On the basis that little, if any, change takes place in the total nitrogen of the apple during cold storage, determinations were made of the changes in different fractions in stored apples from ringed and nonringed trees. Glass electrode readings showed a constant pH of 2.6 until breakdown, when the value rose to 2.9 to 3. The onset of internal breakdown in both ringed and unringed trees could not be associated with any sudden change in protein nitrogen, soluble nitrogen, or any of the soluble nitrogen fractions. During storage there seemed to be a gradual increase in nitrogenous compounds insoluble in 85 percent alcohol and at the same time a decrease in soluble nitrogen compounds. In both lots there was no significant divergence from a constant value for total nitrogen, the average value in the unringed series being 0.0315 percent and in the ringed 0.0254 percent of the initial fresh weight.

Wastage in New Zealand fruit, J. Barker ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 86–88*).—A marked susceptibility of Cox Orange Pippin apples to internal breakdown in 1932 is ascribed to abnormal growing conditions in New Zealand, heavy rains following drought. Much of the bruising injury in boxed apples was found to take place during packing. Precooling of Cox Orange and Jonathan apples did not greatly alter the total wastage but did increase the amount of bitter pit in the former and of soft scald in the latter variety. Late picking greatly increased breakdown in Jonathans in one orchard.

Tolerance of frost and of abnormal atmospheres in New Zealand apples, F. Kidd and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 84–86*).—Two months' exposure to 10 percent carbon dioxide at 34° F. had no injurious or beneficial effects on Delicious, Rome Beauty, Dougherty, Ballarat, Rokewood, Granny Smith, Statesman, Sturmer, and Tasma apples. The authors point out that these New Zealand varieties had already been in storage from 2 to 3 mo. prior to the initiation of the study and that the results are not comparable therefore with freshly stored fruit. Certain of the fruits were held at 0°, −1°, −2°, −3°, and −5° C. At −5° all of the

fruits were badly injured by a short exposure, but at —3° or above there was little visible evidence of injury.

The importance of small differences in temperature in the cold-storage of apples, F. Kidd and C. West ([Gt. Brit.] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 83, 84*).—Apples taken from different positions in the experimental storage chamber at the Ditton Laboratory, East Malling, England, and then stored at a uniform temperature of 37° F., varied sharply in the amount of low temperature breakdown and in color development, although the differences in the average temperature of the original chambers were as little as 1° F.

Gas-storage of apples, F. Kidd and C. West ([Gt. Brit.] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 207-209, 210*).—At the Ditton Laboratory, East Malling, England, Lane Prince Albert, Annie Elizabeth, Cox Orange Pippin, and Ellison Orange apples were stored at temperatures of 33.8°, 39.2°, and 50° F. in atmospheres of 5, 10, and 15 percent carbon dioxide with 2.5, 5, and 10 percent of oxygen, respectively. In each case nitrogen made up the balance. Lane Prince Albert kept best at 39.2° in the 2.5 or 5 percent oxygen and 5 percent carbon dioxide atmosphere; Cox Orange kept best in the 2.5 percent oxygen and 5 percent carbon dioxide atmosphere at the same temperature, with some question as to ultimate quality; Annie Elizabeth held best in the 2.5 percent oxygen and 5 percent carbon dioxide atmosphere at temperatures of 33.8° and 39.2°; and Ellison Orange kept best at 33.8° in an atmosphere of 2.5 or 5 percent oxygen and 5 percent carbon dioxide. With concentrations of oxygen or carbon dioxide or both at 10 percent or above definite injury to fruit was usually observed. Fruits held at 39.2° showed much greater tolerance to carbon dioxide injury than those held at 33.8° or 50°.

Effect on the distribution of nitrogen of storing ground apple-tissue at — 20° C., A. C. Hulme ([Gt. Brit.] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 89, 90*).—Repeated analyses of ground apple tissue stored at —20° failed to show changes in total soluble nitrogen, free ammonia nitrogen, amino nitrogen, and amide nitrogen significantly greater than the standard deviation of extraction and estimation for the series from which the samples were taken.

Effects of temperature on the growth and metabolism of Elberta peach trees, with notes on the growth responses of other varieties, G. T. Nightingale and M. A. Blake (*New Jersey Stas. Bul. 567 (1934), pp. 20*).—Elberta peach trees grown under high and low nitrogen conditions in chambers held at constant temperatures of 52°, 70°, and 95° F., with a relative humidity of 85 percent in all cases, grew most satisfactorily at 70°. At this temperature the trees with nitrogen supplied grew vigorously, and examination showed a marked decrease in the percentage of carbohydrates and an increase in all the determined forms of organic nitrogen in all parts of the trees.

At 52° trees supplied with nitrate became only slightly darker green, and the leaves increased only slightly in area. Carbohydrates accumulated in very high concentration in all trees, indicating a very low rate of respiration as compared with the assimilation of carbohydrates. Nitrate was absorbed readily but remained exclusively in the fine roots, with evidence of only limited assimilation.

At 95° both the trees with and without an external nitrogen supply decreased rapidly in concentration of carbohydrates due to a greater respiration than carbohydrate manufacture. In the trees lacking in nitrate there was a breaking down and reutilization of proteins, evidenced externally by a relatively weak growth of laterals, some increase in greenness, and a loss of all traces of red pigment in the current stem and leaves.

Observations were made on several other varieties, with distinctive responses to seasonal temperatures. Mayflower, known to become dark green early in spring, suffered exceptionally in the 95° chamber, the trees becoming deficient in carbohydrates and showing a tendency to succumb. Carman, which also takes on a dark green color early in spring but is more vigorous than Mayflower, withstood 95° more successfully. Early Crawford, whose foliage tends to remain yellow-green in early spring and whose fruit tends to lack in flavor with temperatures of 90° to 98° during the ripening season, prospered little better than the Mayflower or Carman. Elberta, grown successfully from Georgia to Connecticut and capable of developing good fruits under a wide temperature range, grew better at 95° than did Mayflower, Carman, or Early Crawford. Krummel, a variety with demonstrated high temperature requirements to develop good edibility, continued throughout the experiment to increase in stem length and leaf area at 95°.

Additional facts in regard to the J. H. Hale peach as a parent in breeding work, M. A. Blake (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 124–128*).—Again stating (E.S.R., 69, p. 804) that J. H. Hale is largely a combination of recessive characters, the author presents further supporting data. J. H. Hale × Mexican Honey yielded seedlings closely resembling the Honey peach parent in size of tree and in fruit characters. J. H. Hale × Paragon, a semidwarf Elberta seedling from New Zealand, yielded more progeny resembling J. H. Hale than did any other crop. J. H. Hale × Lemon Cling yielded trees dwarf and compact in type like the Hale parent. J. H. Hale × Chili seedlings, which had hitherto yielded fruit like the Chili parent, produced in 1933 fruits much like Elberta. Not a single tree of a large population of J. H. Hale × Eclipse resembled the mother in either tree or fruit. A marked effect was noted of slight winter injury and cool early spring weather in 1933 on the form, pubescence, and edibility of fruits in some of the J. H. Hale peach crosses.

A study of blackberry and dewberry varieties as breeding material, H. F. Morris (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 117–121; abs. in Texas Sta. Circ. 71 (1933), p. 21*).—At the Texas Experiment Station a large collection of blackberries and dewberries has been assembled as a basis for breeding studies. Some varieties failed to show any value as breeding material, while others were definitely associated with one or more desirable characters. It is emphasized that the heterozygous nature of blackberries makes essential two methods of breeding, first, the growing of large populations in an attempt to secure improvement through mass selection, and second, inbreeding in an effort to isolate the desired factors in a homozygous state. The inbred strains may then be combined through crossing and back-crossing to produce combinations of the desired characters.

Size inheritance in gooseberry fruits, A. S. Colby (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 105–107, fig. 1*).—In studies at the Illinois Experiment Station the Poorman gooseberry was found to carry the largest proportion of factors for large berry size and for this reason is considered desirable in gooseberry breeding programs. There were recorded 5.2 percent of large-fruited seedlings in the Carrie × Poorman and 2.4 percent in the Transparent × Poorman combinations. Several of the large-fruited seedlings were also promising from the standpoint of resistance to leaf diseases and because of a lack of spines.

The genetic constitution of certain red raspberry varieties in relation to their breeding behavior, C. D. Schwartze (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 113–116*).—Records taken by the Washington Experiment Station at Puyallup on seedlings resulting from crosses between six different red raspberries, namely, Cuthbert, Latham, Marlboro, Lloyd George, King, and Antwerp, showed Lloyd George to be outstanding in transmitting large fruit size.

This variety was homozygous, or nearly so, for large fruit size and also for factors producing elongate fruits. Cuthbert proved the most desirable parent from the viewpoint of transmitting flavor. Lloyd George transmitted high acidity. Yellow seedlings were obtained from a Cuthbert by Lloyd George cross, but Latham, King, Antwerp, and Marlboro were homozygous for red color. Lloyd George proved to be a homozygous hermaphrodite, while single-sexed and neuter plants appearing in crosses involving the other five varieties indicated all to be heterozygous for sex.

The best parents in purple raspberry breeding, G. L. Slate (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 108–112*).—Analyzing raspberry breeding records of the New York State Experiment Station from 1893 to date, it was found that in crosses of red raspberries by black raspberries those combinations in which the red was used as the pollen parent were generally more successful than the reciprocal cross. Since both species have the same chromosome number, the author concedes the possibility that the poor results of crosses where the red is the female may be due to partial growth inhibition of pollen tubes in the style or ovary. Of the five breeding combinations (1) black × red, (2) purple × red, (3) purple × purple, (4) purple selfed, and (5) purple × black, the black × red produced by far the highest percentage of promising purple seedlings. Purple × purple and purple selfed yielded seedlings some of which were partially sterile and others less vigorous than their parents. A tabulation of varietal combinations showed Dundee (black) × Newburgh (red) to be one of the most valuable. Since populations with a high percentage of promising seedlings usually contained the most outstanding seedlings, the author suggests the desirability of repeating such crosses on a large scale.

Responses from the use of nitrogen fertilizer on red raspberries, J. S. Shoemaker (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 97–103, fig. 1*).—Records taken on Cuthbert raspberries planted in 1929 and fertilized annually beginning with the spring of 1931 with 250 lb. of ammonium sulfate per acre showed a marked beneficial response both in cane growth and yield from applying nitrogen. In 1931 three unfertilized rows (each 84 ft. long) produced 103, 159, and 127 canes each as compared with 211, 211, and 318 for the three fertilized rows. There was no significant decrease in diameter due to the greater number of canes in the fertilized areas. Observations on the new canes in 1933 showed 30 and 37.7 percent in the unfertilized and fertilized rows, respectively, with heights over 5 ft. In 1932, the year after the first fertilizer treatment, the three unfertilized rows produced a total of 237 pt. of berries as compared with 355.5 pt. for the comparable fertilized rows. In 1933 the corresponding yields were 213.2 and 315.4 pt.

Practical suggestions on the management of raspberry plantations follow.

A contribution to the knowledge of the chemistry of raspberry varieties, with special reference to its bearing on canning quality, L. D. M. Knight (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1932, pp. 32–46*).—An examination of 16 varieties of raspberries grown under comparable conditions showed a large variation in chemical composition. However, these differences were not of a nature to serve as an index to canning quality or for classifying the varieties into dessert and culinary groups. Taste proved an unreliable index to both acidity and content of total sugars. Cloudiness in the sirup of canned fruits was not correlated either with acid content or the percentage of soluble pectin. Good canning quality was closely correlated with high dessert value.

Possibilities of preserving red raspberries by freezing in the Eastern States, J. M. Lutz, H. H. Moon, and J. S. Caldwell (*Fruit Prod. Jour. and*

Amer. Vinegar Indus., 13 (1934), No. 10, pp. 300, 301, fig. 1).—Experiments conducted by the U.S. Department of Agriculture in 1932 with Latham and in 1933 with Latham, Cuthbert, Chief, and Ranere raspberries indicated that a satisfactory frozen product may be obtained with either airtight or nonairtight containers, provided a 50° sirup is used. A temperature of 0° F. is recommended for freezing, although 10° was found satisfactory when the product was rapidly cooled. After freezing red raspberries could be satisfactorily stored at 10°. All four varieties gave an excellent product when frozen in sirup, differing in quality simply as the original varieties varied.

Some observations upon the partial self sterility of the Oberschlesien strawberry and its failure to pollinate Tardive de Leopold, T. SWARBRICK and C. R. THOMPSON (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1932, pp. 24–31, pls. 3*).—The discovery in 1930 of interplanted beds of Tardive de Leopold and Oberschlesien strawberries that were failing to produce satisfactory crops led to controlled experiments in the greenhouse at Long Ashton in which it was demonstrated that Oberschlesien is practically and Tardive de Leopold completely self-unfruitful and that the two varieties are intersterile, in one direction because Tardive de Leopold produces no pollen and in the other direction because Oberschlesien pollen has low and weak viability. Royal Sovereign proved an excellent pollinizer for both varieties.

Some experiments with cranberries and blueberries in Washington, E. C. JOHNSON (*Better Fruit*, 28 (1934), No. 12, pp. 3, 4).—A brief account is presented of the nature and progress of studies at the Cranberry-Blueberry Laboratory of the Washington Experiment Station at Longbeach. Among cranberries found worthy are McFarlin, Howes, Batcheller, Early Red, Pride, and Wales Henry. Of these McFarlin had proved outstanding. Light oils and pyrethrum had been successfully used in controlling fireworm, the worst insect pest of the cranberry. Successful propagation of the blueberry was accomplished by the use of cuttings of current season growth, and some progress was reported in the improvement of the blueberry by selecting desirable seedlings.

The breeding of grapes for juice purposes, R. WELLINGTON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 102–104).—Stating that grape breeding activities at the New York State Experiment Station have yielded about 15,000 seedlings reaching the fruiting age and that undoubtedly many valuable juice grapes have been discarded inadvertently, the author describes certain named and numbered seedlings which have shown value as wine or juice grapes. Among the named varieties are Ontario, Ripley, Seneca, Dunkirk, Hanover, and Westfield. The last named, derived from a Herbert × Concord cross, produces a higher colored juice with greater sugar content than the Concord and is considered valuable as an addition to Concord juice.

Density and arrangement of vines, F. T. BIOLETTI and A. J. WINKLER (*Hilgardia [California Sta.]*, 8 (1934), No. 6, pp. 179–195, figs. 4).—At Davis, Calif., the first crop yield per vine of both the very vigorous Black Prince and the more moderate-growing Muscat of Alexandria was not influenced by planting distances ranging from 4 by 4 ft. to 12 by 12 ft. For the next 3 yr. the yield per vine increased with all distances but more rapidly with the wider spacings, indicating a definite trend in favor of the greater distances. It is believed that with the vigorous Black Prince maximum production per acre might be reached at the greatest distances. Under the conditions of the Davis vineyard, densities of from 300 to 500 vines to the acre with the square system of planting were suitable for obtaining maximum crops with Black Prince and similar strong-growing varieties. For Muscat and other moderate growing varieties the production of the largest crops would require about 600

vines to the acre and perhaps more for weaker-growing varieties. Yields that might be obtained from greater densities than those utilized in the experiment would be offset by the increased cost of various vineyard operations.

Comparisons of the square and avenue systems of planting vines where the number per acre was constant showed that the greater the departure from the square system the greater the restriction in the crop, especially in the early years of production. Although this restricted yield tended to disappear with the course of time, any extreme departure from the square system would, it is believed, cause a permanent loss in productivity.

In the case of Black Prince and Muscats planted 2 by 18 ft., the net losses as compared with 6 by 6 ft. spacings were 20 and 32 percent, respectively.

Vineyard soil management, F. W. Faurot (*Missouri Fruit Sta. Bul. 27* (*1934*), *pp. 15, figs. 6*).—Discussing the general practices of soil management in the Ozark grape vineyards, the author reports that in a Concord planting, set part in 1919 and part in 1921, nitrate of soda had tended to increase both yield of fruit and weight of prunings above those of unfertilized plants, whereas stable manure had tended to reduce the yield of fruit and to materially increase the weight of prunings. The addition of either phosphorus or potash did not significantly influence yields. Phosphorus did, however, greatly increase the growth of cover crops, and, although no supporting data were available, it is believed that phosphorus was giving beneficial results. Vines in grass sod, even when fertilized with nitrate of soda, made scanty growth, and the quality of the fruit was generally below that of the tilled areas.

An experiment in vineyard grafting, L. R. Farish (*Michigan Sta. Quart. Bul., 16* (*1934*), *No. 4, pp. 290–292*).—At the Graham Substation, Campbell Early scions of 2 buds' length were worked at four different dates in the spring of 1932 on four stocks, namely, Clinton, Riparia Gloire de Montpellier, Riparia × Rupestris 101, and Aramon × Rupestris Ganzin No. 1. The respective percentages of success for April 17, May 17, June 6, and July 6 were 85, 88, 67, and 52. Somewhat higher survival was secured with Clinton and Aramon than with the two Riparia stocks.

Respiration, heat-production, and gas-storage of bananas, F. Kidd and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 68–70, fig. 1*).—In accord with earlier noted findings (E.S.R., 68, p. 337), it was again established that the ripening of bananas is retarded by holding them in atmospheres low in oxygen and also that the presence of carbon dioxide is not advantageous. Attempts to remove the excess carbon dioxide by the use of solutions of sodium carbonate were successful, but the accumulation of fruit vapor in the sealed chamber offset the retarding effect of the low oxygen content. Respiration determinations of individual green Gros Michel bananas showed fruits from the same hand to be closely comparable in behavior. Between hands and between bunches there was, however, considerable variation.

Progress report on Citrus Station fertilizer experiments, L. D. Batchelor and E. R. Parker (*Calif. Citrogr., 19* (*1934*), *No. 7, pp. 174, 197, 198, 200*).—An analysis of the first 6 years' records taken by the Citrus Experiment Station, Riverside, Calif., in a citrus fertilizer study, the plan of which was previously outlined (E.S.R., 68, p. 477), has shown the value of nitrogen and organic matter either in the form of stable manure or as turned under cover crops. No clear-cut significant benefit was observed from the use of either phosphate or potash applied as such, although it is conceded that both are ingredients of stable manure and may be factors in the success of the manure. During the first 3 yr. there was no significant difference between clean culture and

cover cropping, but in the second 3 yr. the cover crop plats averaged from 6 to 40 percent more fruit.

In concluding, the authors point out that inorganic nitrogen and stable manure, each providing half the actual nitrogen, supplemented with a winter cover crop is the most satisfactory program so far revealed by the study.

Girdling Valencia orange trees, A. D. SHAMEL and C. S. POMEROY (*Calif. Citrogr., 19 (1934), No. 7, pp. 176, 186*).—Girdling in 1931 and 1932 of trees planted at Corona, Calif., in 1904 resulted in 10.98 and 18.9 percent increases in yield in 1932 and 1933, respectively. At the same time 25 trees girdled for the first time in 1932 averaged 28.75 percent higher yield than comparable ungirdled trees, suggesting a differential seasonal response for the treatment. The 26 trees girdled in 1931 but not again in 1932 produced 19.02 percent less fruit than did ungirdled trees, indicating a depression in yield as an aftermath of the original girdling.

Concentration of orange-juice, T. N. MORRIS ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, pp. 95, 96*).—Preliminary rapid freezing of orange juice at −28° C. until ice crystals began to appear, followed by a slower freezing at −10° with occasional stirring, resulted in a concentrated product containing about 45 percent of soluble solids, which, when diluted, yielded a liquid equal in quality to the original juice. In certain lots of juice a gel formed, resulting presumably from the conversion of pectin to pectic acid through enzymic action.

A method for rapid propagation of dahlias, C. E. WILDON (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 253, 254, fig. 1*).—Cuttings consisting of a leaf with a heel of the stem attached taken from young dahlia plants forced in the greenhouse in February were successfully employed in propagation.

Lawns in Kansas, J. W. ZAHNLEY and L. R. QUINLAN (*Kansas Sta. Bul. 267 (1934), pp. 32, figs. 14*).—General information is presented on the establishment and maintenance of lawns, pointing out desirable species of grass for different purposes and emphasizing the desirability of careful preparation of the soil and abundant fertilization.

FORESTRY

The cut-over lands of Lake County, T. SCHANTZ-HANSEN (*Minnesota Sta. Bul. 304 (1934), pp. 23, figs. 2*).—Stressing the importance of forests in a county in which only 0.43 percent of the land can be classified as improved, the author reports on the present condition of the cut-over forest areas based on an intensive study of plats on widely distributed but representative areas. Originally the cut-over areas were largely coniferous, but subsequent fires have destroyed the conifers and converted the area to hardwoods. Approximately 44 percent of the present cut-over stands were found to be understocked, some to a serious degree. Roughly, the entire cut-over area of the county consisted of 39, 26, 14, 15, 4, and 2 percent, respectively, of hardwoods, mixed hardwoods and conifers, conifers, swamp, muskeg, and barren areas.

A total of 38 percent of the forested cut-over area was in birch and aspen, 32 percent birch and aspen mixed with conifers, and 15 percent conifers. Many of the present stands are said to be on improper sites and should be converted to other species to bring about maximum productivity. The rapid decline of the remaining virgin stands in the county makes imperative improvement of the cut-over areas if the present wood-using industries are to be maintained.

Growth in selectively cut ponderosa pine forests of the Pacific Northwest, W. H. MEYER (*U.S. Dept. Agr., Tech. Bul. 407 (1934), pp. 64, pls. 5, figs.*

15).—Seeking information on the growth rate and expected yield of managed ponderosa pine forests, records were taken on a large number of stands in Oregon and Washington varying widely in volume from practically clean cut to those constituting more than 50 percent of the original volume. The acceleration of growth due to release was observed under average climatic conditions to persist for 40 yr. or more. Peaks of good and poor growth were noted, with an average interval between of 22 yr. Windfalls occurring during the first 4 or 5 yr. after cutting were important factors in ponderosa pine mortality.

Records taken in sample plats in which heavy and light reserves of trees were left following cutting indicated that medium reserves (20 to 30 percent) probably give the largest proportionate yield in the average stand. Data on the growth of individual trees after release showed that the effect of release varies not only with the number of sides released but also with the distance of the release. In cut-over stands the acceleration in diameter growth was not accompanied by an accelerated height growth similar to that which takes place in uncut stands, the final average effect being to drop the height curve throughout its length by 5 to 10 ft. Reproduction present at the time of cutting was found to develop at a very slow rate in selectively cut ponderosa pine forests and to lag after an initial spurt far behind the rate that is normal for free-growing seedlings. On the average the reproduction stand may be expected to produce only about 10 percent of the normal yield for site index 80.

Appended are volume tables for different site qualities for mature and second-growth ponderosa pine.

DISEASES OF PLANTS

[Studies on plant diseases in Delaware] (*Delaware Sta. Bul. 188* (*1934*), *pp. 36–46*).—This report contains brief statements of the results of investigations on the dissemination of yellows and little peach in plums, the control of tomato-seedling diseases, and chemical treatments for control of black rot and other sweetpotato seed bed troubles, all by T. F. Manns; and bacterial spot of stone fruits, bacterial leaf spot and frog-eye leaf spot of soybeans, downy mildew of cucurbits, spray materials for apples, and work with apple scab and peony diseases, all by J. F. Adams.

Parasitic and other Fusaria counted in Colombia soils, O. A. Reinking and M. M. Manns (*Zentbl. Bakt.* [*etc.*], *2. Abt.*, *89* (*1934*), *No. 25–26, pp. 502–509*).—*Fusarium* isolations were made from various soil types ranging from sandy loams to clays in three distinct soil series in the semiarid Santa Marta (Colombia) banana region. Practically all of the 204 samples were from areas planted to bananas, and the *Fusarium* flora may have been influenced by this culture. Fifteen different Fusaria fairly representative of the entire group were isolated from the soils studied. Some had a wide distribution and have been considered as soil fungi, while others less numerous are regarded as soil invaders. In general, the Fusaria found most commonly in Honduras soils were also most abundant in Colombia soils. *F. chlamydosporum* was less frequent, and *F. dimerum* and *F. moniliforme* were more common in Honduras soils. *F. oxysporum* f. 3, the cause of banana wilt, was not isolated from the Colombia soils, and the disease was not present in the Santa Marta region.

The studies further verified the findings in Honduras and Gautemala that the banana wilt organism is not present in soils in which no diseased bananas are growing. No accurate correlation between number of Fusaria and soil type was possible, as different numbers of isolations were made from each soil

type, but it appeared that larger numbers of each fungus, in general, were found in the lighter textured soils.

Plant pathology (*Univ. Adelaide, So. Aust., Waite Agr. Res. Inst. Rpt., 1925–32, pp. 67–74, figs. 4*).—This is a progress report of work of the institute from 1925 to 1933 on various plant diseases, including manganese deficiency, take-all of wheat, and tomato spotted wilt and its transmission by thrips.

The influence of certain spray materials, herbicides, and other compounds on the desiccation of plant tissue, H. A. Runnels and J. D. Wilson (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 104–109*).—Continuing studies on the effect of spray materials on transpiration (E.S.R., 70, pp. 636, 791), the authors cut shoots or leaves from various kinds of growing plants, divided them into lots of equal weight, dipped them immediately into various solutions, hung them up to dry free from contact on the edge of a rotating table, and weighed them as soon as the surface had dried and at subsequent hourly intervals.

"A 4–6–50 Bordeaux mixture was found to increase the rate of drying . . . over that of water-treated checks. When this spray material was mixed with an oil emulsion, a compound which decreases the rate of drying, the mixture was found to have little effect when compared with a water-treated check. When these three materials were applied to transplants of cucumber and tomato, it was found that those treated with an oil emulsion survived in practically the same proportion as untreated ones; whereas, the presence of Bordeaux mixture on the seedlings caused the death of most of them. Strong Bordeaux mixture increased the rate of desiccation [of cut-off shoots] to a greater extent than weaker formulas. Neither hydrated lime nor copper sulfate used alone was as effective as the mixture. Copper sulfate added to lime gave a Bordeaux mixture which was more effective in drying plant tissue than was that made by adding the lime to the copper sulfate. When the amounts of copper sulfate and hydrated lime used in making Bordeaux mixture were varied, it was found that the 4–6–50 formula closely approached the maximum desiccating effect which could be obtained; that is, greater amounts of lime or copper had little effect. The addition of various spreaders and stickers to Bordeaux mixture increased its drying effect slightly. The addition of various insecticides did not do this. Sulfur sprays were found to cause only a slight increase in the rate of tissue desiccation when compared with water-treated checks. A number of oil-containing compounds were found to decrease the rate of drying from 4 to 16 percent when compared with shoots dipped in water. It was found that copper sulfate, when added to hydrated lime, did not stand alone in its effect in increasing the rate of tissue drying, but that ferrous sulfate caused an even greater increase. Zinc sulfate, on the other hand, was not as effective as copper sulfate. When other sulfates used in an N/10 solution were compared with copper sulfate, it was found that the latter was more effective in increasing the rate of desiccation than any of the others used. Of a variety of copper compounds tested, copper chloride was the only one found to cause a greater rate of drying of coleus leaves than did copper sulfate. In a similar experiment in which a number of sodium compounds were used, two of them, sodium chlorate and sodium sulfite, were found to be particularly effective as drying agents. Of a group of compounds sometimes used as herbicides, sodium arsenite was found to have the greatest desiccating effect and ferrous sulfate the least."

Color in relation to virulence in Aplanobacter michiganense, E. H. Fawcett and M. K. Bryan (*Phytopathology, 24 (1934), No. 3, pp. 308, 309*).—Cultural experiments conducted in the U.S. Department of Agriculture with single cell strains of the pink form of *A. michiganense* yielded white and yellow

forms that proved more virulent than the parent form. The results indicated that age of culture, age of dilutions when plated, and the pH of the media may be factors controlling the rough or smooth form and color of colonies. Both the rough and smooth forms occurred in all three colors.—(*Courtesy Biol. Abs.*)

A simple method of obtaining Pythium cultures free from bacteria, J. E. MACHACEK (*Phytopathology, 24 (1934), No. 3, pp. 301–303, fig. 1*).—If a small portion of inoculum obtained from a contaminated culture of *Pythium* was placed on the surface of soft potato dextrose agar within a Petri dish and covered afterwards with a small, sterile glass disk so that the disk was in complete contact with the medium, the contaminating bacteria were retained in the proximity of the inoculum under the disk, while the fungal hyphae, with suitable growing conditions, emerged from beneath the disk within a few days. These hyphae grew to form a bacterium-free mycelium from which transfers to fresh media could be made.

Studies in the biology of Phytophthora infestans (Mont.) de Bary, W. CROSIER (*[New York] Cornell Sta. Mem. 155 (1934), pp. 40, figs. 11*).—Under controlled conditions as many as possible of the factors involved in the host-pathogene-environment complex were studied individually and quantitatively. The isolates of the fungus were obtained in pure culture from potatoes and tomatoes from a number of localities in the United States. They grew very readily on slices of disinfected raw potato tubers and produced an abundance of sporangia. On oatmeal dextrose agar the optimum growth temperature was 21° C., the lower critical temperature was 3°, and the upper near 30°.

Sporangia were produced in a saturated atmosphere at any temperature between 3° and 26°, the optimum being 21°. The average size of sporangia on tuber slices gradually decreased as the temperature increased from 3° to 26°. No sporangia were formed below 91 percent relative humidity. Above 20° they lost viability in from 1 to 3 hr. in dry air and in from 5 to 15 hr. in moist air. Twelve degrees was optimum for indirect (swarmspore) germination; 24° for direct (germ-tube) germination. Sporangia incubated at from 15° to 25° produced abundant secondary sporangia, and these regularly produced tertiary sporangia. Bentonite, a colloidal clay, markedly increased the swarmspore germination of some lots of sporangia.

Swarmspores were motile for periods varying from 15 min. at 24° to 24 hr. at from 1° to 2°. Swarmspore germination occurred at all temperatures between 3° and 28°. Germ-tube elongation was most rapid at from 21° to 24°. Establishment of infection occurred from swarmspores in as short a time as 2.5 hr. at from 10° to 25°. Favorable conditions lasting 10 hr. resulted in from 90 to 100 percent infection. At from 20° to 23° the period of incubation ranged from 66 to 82 hr.; at 10° it was 120 hr., and at 30°, 78 hr. Spread through the host tissue was most rapid at from 20° to 23°. Temperatures up to 40° were tolerated in potato stems.

The author concludes that an epiphytotic will occur whenever correct weather conditions prevail regardless of the age or condition of the host.

Zoospore ciliation in the Plasmodiophorales, G. A. LEDINGHAM (*Nature [London], 133 (1934), No. 3362, p. 534, fig. 1*).—Cotner's method of staining showed the presence of a short cilium in addition to a long cilium on the zoospores of *Plasmodiophora brassicae* and *Spongospora subterranea*, as shown by photomicrographic reproductions published with the article.

The host specificity of Septoria petroselini and S. apii-graveolentis, L. C. COCHRAN (*Phytopathology, 24 (1934), No. 3, pp. 309, 310*).—Further experimental results obtained at the Michigan Experiment Station are presented to show that *S. petroselini* and *S. apii-graveolentis* are entirely distinct and specific to their relative hosts.—(*Courtesy Biol. Abs.*)

Studies in the genus Ustulina—with special reference to parasitism.—I, Introduction, survey of previous literature, and host index, W. H. WILKINS (*Brit. Mycol. Soc. Trans., 18 (1934), pt. 4, pp. 320–346*).—This introductory contribution presents over 250 annotated citations to literature dealing with this genus and a list of more than 50 reported hosts of the different species, with names of the reporters and dates of reports in each case.

Host specialization in the leaf rust of grasses, Puccinia rubigo-vera, E. B. MAINS (*Mich. Acad. Sci., Arts, and Letters, Papers, 17 (1932), pp. 289–394*).—This paper discusses host specialization of a group of rusts, of which the leaf rust of wheat (*P. triticina*) is typical and which can be divided into a number of races that have generally been recognized as distinct species. The work on which this treatise is based was conducted cooperatively by the Indiana Experiment Station and the U.S. Department of Agriculture.

The author discusses the historical basis for his employment of the name *P. rubigo-vera* to designate the group of rusts under consideration. In his investigations collections of teliospores of the rusts to be studied were obtained from various parts of North America and were placed outdoors in cheesecloth bags until they became germinable in the spring. They were then placed directly upon the host species to be tested under conditions favorable for germination. Pycnia usually appeared in about 10 days and aecia in about 15 days. Many aecia thus obtained were used to inoculate a series of species of grasses. In most cases several collections of seeds of one host species from various sources were used, and from 10 to 20 seedlings of each were usually inoculated. Sometimes aecia from natural infections in the field were used. Usually uredia appeared in from 7 to 10 days. The results obtained were ordinarily checked by inoculating a similar series of grasses with the urediospores produced.

The results of these tests showed that most of the races of this rust were sharply restricted to a few species of a single genus for their aecial hosts. In presenting the experimental data the races of the rust have been grouped in sections according to the genera on which the aecia are produced.

"In this study it has been shown that aecia on species of *Thalictrum* are connected with rust on species of *Agropyron*, *Bromus*, *Elymus*, *Hordeum*, *Hystrix*, and *Triticum*; on *Clematis*, with rust on species of *Agropyron*, *Elymus*, *Bromus*, *Hordeum*, and *Hystrix*; on *Anemone*, with rust on species of *Agropyron*, *Elymus*, and *Hordeum*; on *Aquilegia*, with rust on species of *Elymus*; on *Delphinium*, with rust on *Agropyron tenerum*; on *Ranunculus*, with rust on species of *Hordeum*, *Poa*, and *Puccinellia*; on *Anchusa*, with rust on species of *Secale*; on *Onosmodium* and *Macrocalyx*, with rust on species of *Agropyron* and *Elymus*; on *Phacelia*, with rust on species of *Bromus* and *Elymus*; on *Hydrophyllum*, with rust on species of *Elymus* and *Hystrix*; on *Impatiens*, with rust on species of *Agropyron*, *Elymus*, *Hordeum*, and *Hystrix*.

"Fifty-six races are recognized in *Puccinia rubigo-vera*, distinguished by differences in their host specialization. *P. alternans*, *P. persistens*, *P. triticina*, *P. agrostidis*, *P. obliterata*, *P. perlexans*, *P. actaeae-agropyri*, *P. actaeae-elymi*, *P. aconitirubrae*, *P. dietrichiana*, *P. dispersa* (*P. secalina*), *P. symphyti-bromorum*, *P. bromina*, *P. procera*, and *P. impatientis* are considered to be races of *P. rubigo-vera*."

The detailed presentation of the inoculation studies is followed by three indexes, the first arranged according to the aecial hosts, the second according to the uredial and telial hosts, and the third according to the names of the races of *P. rubigo-vera*, their synonyms, and related species.

Snowmold of turf grasses as caused by Fusarium nivale, A. S. DAHL (*Phytopathology, 24 (1934), No. 3, pp. 197–214, figs. 6*).—This contribution from

the U.S. Department of Agriculture reports that snow mold on turf grasses in the United States and Canada was found to be caused by *F. nivale*. The disease occurs on turf in the form of irregularly circular patches of dead grass which appear as the snow is melting. The patches usually are from a few inches to a foot or more in diameter and may run together to cover large areas.

Temperature studies showed that the organism grew at temperatures from 2° to 32° C., with an optimum of about 20° (68° F.) Creeping bent, Kentucky bluegrass, redtop, red fescue, barley, rye, wheat, and oats were artificially inoculated in low temperature moist chambers. The most rapid and injurious infections took place in chambers kept at 0°–5°. At 15°–20° infections were slight and very slow. The organism was found to enter the leaves through the stomata. Its progress through the tissue was intercellular until the cells began to collapse, then it became intracellular. After the mycelium became abundant in the tissue, sporodochia were formed on the leaf over the stomatal openings so that they occurred in rows on the leaf.

Observations indicated that climatic conditions greatly influenced the amount of snow mold. The conditions that favored attacks of the disease were abundant moisture in the fall, snow falling on unfrozen ground, deep snow, and a prolonged cold, wet spring. Applying fertilizer late in the fall was found to make attacks of snow mold more serious. Where the soil had abundant organic matter or where the greens were covered with straw there was an increase of the disease. Field experiments showed that the disease could be controlled by treating the turf in the autumn with corrosive sublimate or calomel at the rate of 3 oz. to 1,000 sq. ft. Smaller quantities were only partially effective. A marked difference in susceptibility to the disease was found in the grasses used on golf courses.

The effect of different temperatures on the reaction of Hope wheat to bunt, W. K. Smith (*Phytopathology, 22 (1932), No. 7, pp. 615–627, fig. 1*).—This contribution from the Washington Experiment Station reports that Hope, a variety of *Triticum vulgare*, proved highly resistant to 5 physiologic forms of bunt (3 of *T. tritici* and 2 of *T. levis*) when spring planted at the usual date, and that it was moderately susceptible to all of them when planted at the usual fall planting. Hope wheat was then tested in the greenhouse alongside of Jenkin, a variety of *T. compactum* highly susceptible to bunt in the field. Controlled temperatures were employed, and a single physiologic form of bunt (T2) was employed for artificial contamination of the seed. It was found that Hope was highly resistant to this strain of bunt when germinated at low temperatures (8°–12° C.) then removed to higher temperatures (20°–22°) after emergence, but quite susceptible when allowed to mature at the lower temperatures. Jenkin, however, was susceptible under both conditions.

What the factors were which inhibited the smut development in Hope wheat under the conditions mentioned was not determined.

The effect of bunt on yield of wheat, H. H. Flor, E. F. Gaines, and W. K. Smith (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 778–784*).—Three winter wheats, Hybrid 128 (susceptible), Turkey (intermediate), and Ridit (resistant), showed a reduction in yield roughly proportional to the percentage of bunted heads for Hybrid 128 and Turkey. Ridit, however, with but 1 percent of bunted heads, was reduced 11 percent in yield.

Reaction of Martin wheat to three physiologic forms of Tilletia tritici, W. K. Smith (*Phytopathology, 22 (1932), No. 10, pp. 847–850, figs. 2*).—This contribution from the Washington Experiment Station reports that Martin wheat produced no smut when inoculated with *T. tritici* form 1. It became infected

to the extent of 19 percent when inoculated with *T. tritici* form 2. The smut balls produced were not normal, but were very small, shriveled, and angular, and the spikes borne by infected plants resembled sterile spikes in appearance. It produced 71 percent of smutted heads when inoculated with *T. tritici* form 3, and the smut balls in this case were quite normal. In the same experiment Hybrid 128 proved to be uniformly susceptible to all forms.

Inheritance of resistance to loose smut in certain wheat crosses, D. C. TINGEY and B. TOLMAN (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 7, pp. 631–655, figs. 5*).—From a study at the Utah Experiment Station of a number of varieties and strains of wheat on the effect of various methods and stages of inoculation on loose smut infection, it was shown that maximum infection was obtained only when the smut spores were placed directly on the stigmas and by inoculating any time before or during the bloom stage. In the genetic studies on loose smut, triplicate randomized plantings were made in two of the crosses and duplicate seedings in the other.

From the genetic studies the following factorial relationships were proposed: For loose smut resistance, Hope $R_1R_1R_2R_2R_3R_3$ (immune), Preston $R_1R_1R_2R_2r_3r_3$ (highly resistant), 01–24 $r_1r_1R_2R_2R_3R_3$ (moderately resistant) Dicklow No. 3 $r_1r_1r_2r_2R_3R_3$ (slight resistance), and Federation $r_1r_1r_2r_2r_3r_3$ (susceptible). For awn inheritance, Hope and Preston *AABB* (awned), 01–24 and Dicklow No. 3 *aaBB*, and Federation *aabb*. For kernel color inheritance, Hope $K_1K_1K_2K_2K_3K_3$ (red kernel), Preston $K_1K_1k_2k_2k_3k_3$ (red kernel), and 01–24, Dicklow No. 3, and Federation completely recessive (white kernel). Only one factor difference was noticed in chaff color. No correlation was found between any of the morphological characters and loose smut resistance.

Wheat smuts [trans. title], O. MUNERATI (*Italia Agr.*, *69* (*1932*), *No. 12, pp. 1052–1058, figs. 4*).—Observations gave no definite confirmation of the statement that wheat attacked by *Tilletia tritici* and *T. laevis* is more susceptible to rust. In regard to the dwarfing of wheat plants attributed to the effect of smut, the author also decides that the evidence is not conclusive. Differences in behavior of biological races and physiological forms of the parasites, as well as those due to host varieties, can account for the discrepancies found in results.—(*Courtesy Biol. Abs.*)

The control of stinking smut of wheat: Experiments on seed treatment with various dusts, J. C. NEILL (*New Zeal. Jour. Agr.*, *48* (*1934*), *No. 3, pp. 170, 171*).—With heavy natural infection, control was obtained only with Ceresan New. Ceresan was nearly as effective, but Agrosan G and Semesan were much less so. No correlation was apparent between mercury content and fungicidal value, though the sample of Semesan had been in the laboratory for 3 yr. and may have deteriorated. Of the copper compounds, excluding the insufficiently tested No. 1 copper carbonate, Smutol (copper oxychloride) gave the best results, followed closely by copper carbonates in the order of relative copper content. Infection in Jumbuck wheat was lighter than in Tuscan. With this wheat all of the dusts gave good control, only Agrosan G, Semesan, and the low copper content carbonate failing to eliminate it completely. There were no significant differences in the degree of control by monthly treatments between harvest and sowing. The number of plants harvested per 100 seeds sown varied very little between any of the treatments, though in general treated seeds showed slightly better results.

Effect of excess of disinfectant dusts on the field germination of seed wheat, J. C. NEILL (*New Zeal. Jour. Agr.*, *48* (*1934*), *No. 3, p. 174*).—Experiments showed excess copper carbonate (high or low grade) and Agrosan G to have little or no effect on field germination of wheat where sown with

or without superphosphate. Ceresan in excess practically inhibited germination under the same conditions, while Ceresan New in excess caused severe injury without fertilizer but gave slightly better germination than untreated seed when sown with superphosphate.

Studies on alfalfa mosaic, J. L. Weimer (*Phytopathology, 24 (1934), No. 3, pp. 239–247, figs. 3*).—In this contribution from the U.S. Department of Agriculture, an apparently widespread transmissible virosis of alfalfa, of the mosaic type, is described and illustrated. The disease was successfully transmitted by means of the pea aphid *Illinoia pisi*. Symptoms were not evident in the field during either hot or cold weather, but were often very conspicuous during moderately cool spring and autumn months. No indication of resistance was observed in more than 100 strains and varieties of alfalfa. No evidence was obtained that the disease is carried in seed or soil. Alfalfa is thought to be susceptible to attack by other mosaiclike viruses also.

Soil treatment in relation to clubroot of cabbage, R. H. Larson and J. C. Walker (*Jour. Agr. Res. [U.S.] 48 (1934), No. 8, pp. 749–759*).—In experiments conducted by the Wisconsin Experiment Station and the Bureau of Plant Industry, U.S.D.A., cooperating, applications of calcium hydrate, dolomitic hydrate, and Agstone (finely divided dolomitic limestone) to Carrington silty clay loam and Clyde silty clay loam soil in southeastern Wisconsin naturally infested with the clubroot organism (*Plasmodiophora brassicae*) failed to give commercially practical control in 1930, 1931, and 1932, except in lower areas in the fields where the soil moisture level was higher than the average. When soil samples of the treated areas were removed to the greenhouse and cabbage plants grown in them at various fairly constant soil moisture levels, the plants remained free from infection. When the soil moisture of treated soils was allowed to fluctuate at a relatively low soil moisture level, 100 percent infection occurred. Forced aeration of treated soil at high moisture resulted in 35–40 percent infection. Calcium hydrate, calcium carbonate, calcium oxide, and magnesium carbonate all reduced infection perceptibly in well-watered soil in the greenhouse when added in sufficient amounts to raise the reaction of an acid soil to about pH 7.0, and usually inhibited infection completely at pH 7.2 or above.

It is suggested that low fluctuating soil moisture is an influential factor in limiting the effectiveness of lime as a clubroot inhibitor under field conditions in the soils studied.

Production of cabbage seed free from Phoma lingam and Bacterium campestre, J. C. Walker (*Phytopathology, 24 (1934), No. 2, pp. 158–160*).—A comparison of plantings of cabbage seed inoculated with the black rot organism *B. campestre* and exposed to natural rainfall with those protected from rain at Madison, Wis., demonstrated that spattering rain is an important factor in dissemination in the seed bed. A comparison of plantings in the cabbage seed-growing area of Skagit Valley, Wash., with those at Madison showed that the low precipitation after seed sowing in the former area decidedly interfered with the spread of both the black rot organism and the blackleg organism *P. lingam* in the seed bed. Thus even though these organisms are introduced into the Washington area on stock seed, the possibility of their producing epidemics is remote. This confirms and explains the consistent freedom of Skagit Valley cabbage seed from these parasites over a period of some 10 yr.

Celery yellows in Ohio, J. D. Wilson (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 109–115, figs. 2*).—The author outlines Ohio experiences with this serious yellowing and stunting disease, caused by *Fusarium* sp., since its first appear-

"Experiments in which four varieties of celery were grown in soil at controlled temperatures indicated the optimum temperature for the growth of the celery plant to lie between 20° and 24° C. (68° and 75° F.). The disease was found to be active on the susceptible tall strain of Golden Self-blanching from 20° to 32°. At 20° the plants were off-color and slightly stunted, at 28° part of them died in a few weeks, and at 32° all of the plants died within a period of 3 weeks after transplanting. Thus, the optimum temperature for the disease is above 28°, with the maximum possibly several degrees higher. Symptoms of the disease were present on Wonderful and Early Fortune at 24° and on Michigan Golden at 28°. At 32° all of the varieties showed definite injury from the disease. . . .

"Field trials of several varieties made at Celeryville in 1932 and 1933 showed Columbia, a green variety, to be very resistant. This was also true of Michigan Golden, a yellows-resistant selection made at Michigan State College from the tall strain of Golden Self-blanching. The yellow varieties, Golden Self-blanching, Hoover Special, and Golden Phenomenal, were very susceptible. Several varieties intermediate in characters between the true green and yellow types were more resistant than the three varieties just mentioned. They included Florida Golden, Golden Prize, Early Fortune, Newark Market, Golden Plume, and Wonderful. Michigan Golden, besides having shown a high degree of resistance to yellows at Celeryville, also possesses other good characteristics which seem to make it an excellent celery for use in fields where the disease occurs, even intermittently."

Variety tests in the differentiation of two cotton wilts, W. N. Ezekiel and J. J. Taubenhaus (*Phytopathology, 24 (1934), No. 3, pp. 292–295, fig. 1*).—In this Texas Experiment Station investigation, cotton varieties were tested in Brazos County for 4 yr. for resistance to *Fusarium vasinfectum* wilt, and in Ellis County for 2 yr. for resistance to an apparently different wilt found there and designated temporarily as Waxahachie wilt. Varieties resistant to *F. vasinfectum* wilt were generally consistently resistant, while susceptible varieties were fairly consistently susceptible in the various years. Varieties resistant to this disease were not, however, necessarily resistant to the Waxahachie wilt, nor was susceptibility to the one disease correlated significantly with susceptibility to the other. This appears to constitute an additional distinction between the two diseases.

Powdery mildew of flax in Minnesota, C. C. Allison (*Phytopathology, 24 (1934), No. 3, pp. 305–307*).—In September, 1933, a powdery mildew was observed on flax in the Coon Creek experimental plats near Anoka, Minn. This report from the Minnesota Experiment Station is thought to give its first recorded appearance in North America. Two varieties, C.I. 669 and C.I. 743, were heavily infected. On the basis of the characters of the perithecia, asci, ascospores, and conidia, descriptions of which are given, the mildew was identified as *Erysiphe cichoracearum*. A comparison of size of conidia indicates that the Minnesota mildew is the same as the conidial stage described by V. Škorić, Y. Homma, and E. S. Salmon and M. W. Ware, but distinctly different from *E. polygoni* described by Homma.—(*Courtesy Biol. Abs.*)

Brown tip of hops [trans. title], Weigand (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz, 8 (1930), No. 5, pp. 102–105, fig. 1*).—This article describes a nonparasitic browning of the leaf edges and of the cone scales of hops. The precise cause remains for future studies to work out.

Onion-bulb decay caused by Aspergillus alliaceus, J. C. Walker and A. Murphy (*Phytopathology, 24 (1934), No. 3, pp. 289–291, fig. 1*).—This paper records the results of cooperative studies by the U.S. Department of Agriculture

and the Wisconsin Experiment Station. *A. alliaceus* has been intercepted twice on garlic from Italy. Isolates from each collection were studied in culture. Conidial heads were yellow at first, becoming brown with age. Sclerotia formed promptly, were white at first, then brown, and finally black. Onion bulbs were successfully inoculated through wounds. The infected tissue was water-soaked at first, but shrunk promptly, resulting in a dry rot. Mycelial mats formed between the bulb scales, and sclerotia occurred throughout the decayed tissue. On potato dextrose agar the minimum temperature for growth was below 15° C., the maximum above 40°, and the optimum about 32°. The fungus apparently is not pathogenic upon the growing plant, but only upon the mature bulbs and at rather high temperatures.

Influence of manures on the wilt disease of Cajanus indicus Spreng., and the isolation of types resistant to the disease, W. McRae and F. J. F. Shaw (*Imp. Council Agr. Res.* [*India*], *Sci. Monog.* 7 (*1933*), *pp.* [*4*]+*68*, *pls.* *16*).—In a study of the incidence of wilt of pigeonpea (rahar) in fertilizer plats at Pusa from 1918 to 1929 and in special plats set up for the study of the disease, it was found that fertilizing with superphosphate and cattle manure tended to increase the wilt, while the use of *Crotalaria juncea* as a green manure tended to decrease it. Superphosphate and *Crotalaria* together, however, resulted in increased wilt.

The causal fungus was found to be carried from crop to crop in the soil mostly through dead roots below cultivation depth, although to some extent by dead roots in the top 6 in. of soil and to a smaller extent by transmission on the seed.

Starting with plants of pigeonpea surviving in 1923 in an artificially infected field, the seed from each plant was planted in a separate row the following season in the same field. Selected plants in the two rows which were most promising were then protected against cross-pollination, and the selfed seeds from each plant were used to continue the work the next year. The same procedure was continued for 7 successive years. Several resulting selections proved highly resistant to the disease in fields under ordinary rotation as compared with common types of pigeonpea, but when seed of such resistant strains was planted in fields where pigeonpeas had been grown for three or more seasons in succession, the plants often wilted rather badly. Resistance was not found correlated with any of the morphologic characteristics studied.

Soil treatments with mercurials for the control of potato scab, C. W. Frutchey and J. H. Muncie (*Michigan Sta. Quart. Bul.*, *16* (*1934*), *No. 4*, *pp.* *259–263*).—In an effort made to find out whether soil treatments with mercury compounds might successfully reduce attacks of potato scab, yellow oxide of mercury, calomel, and an organic mercury compound of undesignated composition were thoroughly mixed with sand and applied directly in the rows before the potato seed pieces were dropped. Calomel was used at the rate of 20 lb. per acre, the others at the rate of 10 lb. The work was done in 1931 and 1932 in 5 counties of Michigan on typical potato soil, which tested between pH 6.8 and 7.2. Seed potatoes of the Russet Rural variety were used after prior disinfection with standard $HgCl_2$. In neither year did any of these materials cause a suppression of scab in comparison with the amount in the check rows. In fact, where calomel and yellow oxide of mercury were employed considerably more scab developed than in the untreated rows.

Subsequent tests, established to determine the actual effect of these materials upon the fungi of the genus *Actinomyces* at different percentages of soil moisture, showed that when the moisture level was low the relative proportion of *Actinomyces* over other soil organisms increased in the presence of the

mercurials. With moisture percentages running from 55 to 100, however, the mercurials appeared to depress the *Actinomyces*. Fifty-seven isolates of *A. scabies* were then grown in liquid tyrosinate medium, with 3 different concentrations of yellow oxide of mercury and calomel added. A considerable number of the strains showed remarkable tolerance to the presence of these compounds in the culture medium, although some delay in growth took place. Pathogenicity tests with a number of these isolates showed that there was no evident correlation between tolerance to mercurials and virulence of attack.

The authors conclude that the presence of small amounts of mercurials in the soil, though not affecting *A. scabies*, did inhibit the growth of other soil organisms, allowing the scab fungus to develop more rapidly, especially in soils of low moisture content. It is concluded that the materials tested are not to be recommended as soil treatments for the control of potato scab under Michigan conditions.

The longevity of the latent and veinbanding viruses of potato in dried plant tissue, G. BURNETT (*Phytopathology, 24 (1934), No. 3, pp. 215–227*).—In this contribution from the Washington Experiment Station, experimental results are presented showing that the latent and vein-banding viruses retain their infectivity in dried plant tissue much longer than is indicated in the previous literature. Inoculations involving 510 series of dried inoculum of the latent virus, when macerated in water and inoculated on 3,743 tobacco and tomato plants, showed that the latent virus, when dried alone in plant tissue, was infective after being dried for 286 days in tobacco and 263 days in potato, but for not over 50 days in tomato. In a similar manner, 329 series of dried inoculum of the vein-banding virus, when inoculated on 2,355 tobacco plants, showed that this virus, when dried alone in plant tissue, was infective after being dried for 50 days in potato and tobacco, but for only 17 days in tomato. The latent virus, when dried in foliage in combination with tobacco mosaic (streak of tomato), remained infective longer than when dried alone. It (in the combination) was recovered from potato, tomato, and tobacco foliage that had been dried for periods of 352, 1,251, and 618 days, respectively. These latter results were obtained from inoculations involving 86 series of dried inoculum on 1,510 tomato plants.

How often should the potato grower renew his stock? O. BUTLER (*New Hampshire Sta. Circ. 45 (1934), pp. 8, figs. 2*).—For New Hampshire potato growers the author discusses the effect of climate on healthy potatoes and those affected with mosaic and leaf-roll, and the rate of increase of these diseases from year to year in different parts of the State as studied by the station. It is concluded that in the northern part of the State growers of table stock, who use certified seed of high quality to start with, should renew the seed every fourth year, using seed from their own fields in the interim. If only average quality certified seed, however, is used, the renewal should take place every third year. In the rest of the State certified seed should be renewed every year except in the western intermediate area, where high quality certified seed might safely be renewed every third year.

Plant-tissue relations of the sugar-beet curly-top virus, C. W. BENNETT (*Jour. Agr. Res. [U.S.], 48 (1934), No. 8, pp. 665–701, figs. 10*).—Curly top infection was not obtained by allowing virus-containing liquids to pass into the tracheae of beet plants. Of other methods of artificial inoculation tried, only the use of the phloem exudate of a curly top beet produced an appreciable percentage of infection. Infection is produced readily, however, by the beet leaf hopper (*Eutettix tenellus*), which feeds on the phloem tissue. The mouth parts penetrate cell walls without difficulty, and a sheath is laid down by the insect

along the path of puncture, which probably effectually walls off contents of cells of tissues exterior to the bundles. Leaf hoppers acquired very little virus when allowed to feed on parenchyma tissue only, but had no difficulty in acquiring virus from neighboring beet tissues containing vascular bundles.

Infection was produced by grafting, but the virus did not pass the graft unions until vascular elements were formed. In most cases the virus failed to pass ringed areas in the stems of *Nicotiana tabacum* and *N. glauca* in which phloem continuity was severed. In the few instances in which the virus passed such areas, the internal and external phloem had been removed at different levels in an internode. In these plants areas of regenerated tissue had united the internal and external phloem through the medullary rays before symptoms appeared in parts across the rings. In stems where there was a phloem avenue for movement through the internal phloem, the external phloem or through a combination of the two, the virus passed the ringed areas without measurable delay.

The virus moved slowly downward from the inoculated tip of *N. tabacum* plants a distance of 24 in. in 48 hr. In cotyledons of beet plants it moved more rapidly, 1 in. in 2 min., and in leaves of larger beets it moved 6 in. in 6 min. It is concluded that the curly top virus is closely associated with the phloem and that its movement in the plant is correlated with, and to a large extent dependent on, the movement of elaborated food.

Cell degeneration in relation to sieve-tube differentiation in curly-top beets: A preliminary note, K. Esau (*Phytopathology, 24 (1934), No. 3, pp. 303–305, fig. 1*).—This contribution from the California Experiment Station reports that protoplast degeneration characteristic of curly top phloem of the sugar beet is initiated in cells lying adjacent to the first formed sieve tubes. This localization of the first symptoms is evident in the secondary vascular rings of the fleshy root, as well as in the root tips.—(*Courtesy Biol. Abs.*)

Pathology, J. P. Martin (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Com., 1933, pp. 24–35*).—This is a summary of studies by members of the station staff on plantation inspections, the Molokai quarantine project, leaf scald disease, eyespot disease, growth failure, mosaic disease, brown stripe disease, nutritional studies, chlorotic streak disease, internal stalk necrosis, nodal stalk rot, measuring available potassium in soils by the *Aspergillus* method, histology of cane diseases, and on the cytology of sugarcane, including chromosome counts.—(*Courtesy Biol. Abs.*)

Occurrence of tobacco ring-spot-like viruses in sweet clover, R. G. Henderson (*Phytopathology, 24 (1934), No. 3, pp. 248–256, figs. 4*).—This contribution from the Virginia Experiment Station reports that ring-spot-like effects have been produced on tobacco by artificial inoculation with viruses obtained from abnormal sweetclover plants. Usually these viruses from sweetclover produced on tobacco less severe symptoms than did the true tobacco ring spot virus. The precise relation between the sweetclover viruses and the tobacco ring spot virus remains to be determined. A description is given of the symptoms produced by mechanical inoculation on tobacco, sweetclover, and petunia with an apparently new type of virus obtained from sweetclover (*Melilotus alba*). On tobacco this virus produced symptoms distinctly different from those of ring spot.

[Tobacco investigations in Maryland] (*Maryland Sta. Rpt. 1933, p. XXXII*).—The report mentions results of work on potash and magnesium deficiency in relation to "sand drown" of tobacco, on the association of kind and sources of plant food with the prevalence of certain diseased conditions, and on the ineffectiveness of Bordeaux mixture for complete control of downy mildew of tobacco.

The occurrence of Rhizoctonia and Phytophthora on the tobacco nurseries in the residence of Besoeki (Java) [trans. title], G. A. REYDON (*Meded. Besoek. Proefsta.* [*Java*], *No. 50* (*1933*), *pp. 39–51, figs. 5; Eng. abs., p. 51*).—The author records for the first time the occurrence and general spreading of *R. solani* in the tobacco nurseries of the residency of Besoeki. Usually a diagnosis of *Rhizoctonia* and *Phytophthora* in the nurseries is not reliable, and it is very risky to use sound looking planting material from a nursery where *Phytophthora* occurs. For this reason it is necessary to record for each case of damping-off whether it is due to *Phytophthora* or not. *Rhizoctonia* causes much damage to young seedlings only when they are growing close together and when the water supply is abundant. In contrast to *Phytophthora*, the disease also can spread very quickly during dry and sunny weather. One can limit damage from *Rhizoctonia* by sowing less seed and by exposing the young plants to sunlight as soon as possible. Usually *Phytophthora* can be successfully controlled by spraying with Bordeaux mixture (1 percent).

A noninfectious leaf-deforming principle from mosaic tomato plants, H. R. KRAYBILL, P. H. BREWER, R. W. SAMSON, and M. W. GARDNER (*Phytopathology, 22* (*1932*), *No. 7, pp. 629–636, figs. 2*).—This contribution from the Indiana Experiment Station reports that "filiform leaf deformities closely resembling certain mosaic symptoms were produced on the new growth of young tomato plants by heavy inoculation with preparations obtained from mosaic plants and rendered noninfectious by filtration. Subsequently normal growth was resumed. Leaf deformities were not produced by inoculation with similarly prepared juices from healthy tomato plants. The leaf deformities were readily produced with infectious preparations previously stored in vitro so long that the possibility of the presence of active cucumber mosaic virus was eliminated. When plants showing marked leaf deformities as a result of inoculation with the leaf-deforming principle were crushed and used as inoculum for healthy plants, no deformities resulted . . . The inoculation of healthy tomato plants with the leaf-deforming principle combined with the potato virus did not produce the disease known as streak, whereas streak would have been produced had the tomato mosaic virus been present. Likewise, inoculation with the juice of plants showing only the leaf deformities and with the potato virus failed to produce streak. The leaf-deforming principle was not destroyed by heating for 2½ hr. at 126° C. This indicates that it is not of the nature of a virus and that it is nonliving." The results indicate that it is produced only in the diseased tomato tissues. Whether the principle is a product of the virus or merely a decomposition product of the constitutents of the mosaic plant is uncertain.

***The Bruce club-root resistant turnip: Experiments and farmers' trials* in Otago-Southland,** R. B. TENNET (*New Zeal. Jour. Agr., 47* (*1933*), *No. 5, pp. 297–301*).—It is stated that from experimental work and farmers' trials carried out over the past 3 yr., planting of resistant strains of Bruce turnip, an old Scotch variety, can confidently be recommended, even on land infected with clubroot.

Some new observations concerning blue mold decay of apples, F. D. HEALD and K. F. BAKER (*Wash. State Hort. Assoc. Proc., 28* (*1932*), *pp. 164–174*).—Examination of a considerable number of experimental and commercial lots of apples, including five varieties, showed that infection of uninjured fruit by spores of blue mold (*Penicillium expansum*) readily took place through the lenticels. In fact, in one lot over twice as much decay started at the lenticels as at other points.

Tests with the three principal solvents used for removing arsenical spray residue showed that 1 percent hydrochloric acid killed 100 percent of the blue

mold spores within 72 hr. at 90° F., that sodium carbonate-trisodium phosphate (60 lb. per 100 gal.) caused total death at 90° within 24 hr., and that sodium carbonate-borax (1.5 lb. per gal.) produced death of spores in 72–84 hr. Total death occurred with the first two solutions mentioned within 12 hr. at 100°, while at 110° hydrochloric acid killed all spores in 5 hr. and the sodium carbonate-trisodium phosphate in 6–7 hr. Hence practically all spores left over night in wash water at 110° would doubtless be dead the next morning.

Some problems concerning blue mold in relation to cleaning and packing of apples, K. F. Baker and F. D. Heald (*Phytopathology, 22 (1932), No. 11, pp. 879–898, fig. 1*).—This contribution from the Washington Experiment Station gives the details of work and results more popularly presented in the article noted above. The tank used for washing apples for the removal of spray residue was found to be one of the main sources of blue mold contamination. Therefore, the authors tested the effects of three standard washing solutions on the viability of blue mold spores at different temperatures over different lengths of time.

Water alone, when elevated above 90° F., was found to exert a lethal effect on spores of *Penicillium expansum*. This action was markedly increased by the addition of the cleaning chemicals, which consisted of hydrochloric acid (3 percent by volume), sodium carbonate-trisodium phosphate (equal parts of each and used at the rate of slightly over 7 percent by weight in water), and sodium carbonate-borax (100 parts soda ash to 1 part borax used at a little less than 18 percent by weight in water). The action is of a slow type. No action would occur on spores on apples during their brief exposure in washing. The action is rapid enough, however, to kill practically all the spores in a solution when held over between one day's operations and those of the next. The lethal action of sodium carbonate-borax was shown to be due to the sodium carbonate constituent.

Old spores were consistently more resistant to the toxic agents tested than young ones. No spores germinated in sterile distilled or tap water at room temperature or 90°. In 2 percent apple-juice solution at room temperature, they germinated in 12 hr., but at 90° they did not germinate in 14 days. They germinated in sterile apple juice at 32° in 7 days and germinated readily after being held in 10 percent apple juice for over 101 hr. at 21°–25°. Sodium hypochlorite solutions were found to be very toxic to the spores. It is suggested that they could well be used for spraying apple packing house equipment to reduce spore contamination.

Lessons of 1933 in apple scab control and recommendations for 1934, A. L. Pierstorff (*Ohio State Hort. Soc. Proc., 67 (1934), pp. 28–31*).—The results are given of an apple scab survey of 45 orchards in 1933 as compared with surveys of the five preceding years. The set of fruit on Jonathan and Grimes was materially reduced by spray burn, which was often severe on foliage that developed during wet, dull weather. Wettable sulfurs did not equal lime-sulfur in effectiveness.

Brown rot infection of peaches in 1933 and report of the committee on fruit diseases, E. M. Stoddard (*Conn. Pomol. Soc. Proc., 43 (1933), pp. 41–44*).—This is a report on an epiphytotic of brown rot on peaches and on the incidence of other diseases of peaches and of apples in Connecticut.

Progress report of investigations on a new peach trouble, E. M. Stoddard (*Conn. Pomol. Soc. Proc., 43 (1933), pp. 115–117*).—This discusses investigations started on a disease of unknown cause, characterized by premature yellowing and ripening of leaves on a part of the branches at midseason or later, usually accompanied by falling of leaves and fruit on these branches.

Yellow rust of Rubus, S. M. Zeller and W. T. Lund (*Phytopathology, 24 (1934), No. 3, pp. 257–265, fig. 1*).—Basing their opinion on studies conducted at the Oregon Experiment Station, the authors are now convinced that yellow rust of *Rubus* is caused by the European fungus *Phragmidium rubi-idaei* (*P. imitans*). Its life history was found to be essentially the same as that described by V. H. Blackman and A. H. Christman for other species of *Phragmidium*. Waves of aecial and uredial development in the field were correlated with wet weather periods. A check against greenhouse inoculation tests under controlled conditions indicates that precipitation or high humidity accompanied by slight lowering of temperature, which brings about free water on the leaf surface, is conducive to infection by the sporidia, aeciospores, and urediospores. The susceptibility of *Rubus* and *Rosa* was tested by greenhouse inoculation. The following proved to be immune: All the blackberries tested, *Rubus parviflorus*, *R. spectabilis*, the Munger and Plum Farmer varieties of *R. occidentalis*, and the three roses *Rosa gymnocarpa*, *R. nutkana*, and *R. rubiginosa*. Among the red raspberries tested, Chief and Latham were resistant, Lloyd George was disease-tolerant, Antwerp, Owasco, and Seneca were fairly resistant, while Marlboro, Cuthbert, Golden Queen, Herbert, Cayuga, and Ranere were susceptible in the order named.

Olive knot on Olea chrysophylla, C. O. Smith (*Phytopathology, 24 (1934), No. 3, pp. 307, 308, fig. 1*).—Artificial knots were produced on *O. chrysophylla* by *Bacterium savastanoi*. These differed in appearance from those made on *O. europea* and were less globose and more irregular in form. This difference is believed to be due to a difference in growth response between the organism and the individual hosts.

Manual of citrus culture.—II, Diseases, pests, and their treatment, A. Bitancourt, J. P. Fonseca, and M. Autuori (*Manual de citricultura.—II, Doencas, pragas e tratamentos. São Paulo: Chacaras & Quintaes, 1933, vol. 2, pp. 212, figs. 183*).—More than 30 parasitic and nonparasitic disorders of citrus are described and illustrated. Suggestions for control are given.

Control of Phytophthora heart rot of pineapple plants, F. P. Mehrlich, (*Phytopathology, 24 (1934), No. 3, pp. 173–196, figs. 4*).—Heart rot of the pineapple plant in Hawaii is caused by 3 species of Phytophthora, namely, *P. cinnamomi*, *P. parasitica*, and *P. palmivora*. Experiments in naturally infested areas involving 2 of these fungi have shown that Bordeaux mixture 1–0.7–3 as a dip gives effective and economical control. This formula was selected from 67 formulas of 22 liquid and 12 dry fungicides tried. Bordeaux mixture 1–0.7–3, applied by completely immersing planting material in it, has given better control than larger quantities of the same or different fungicides applied in other ways. With a single application in 8 separate experiments, under conditions extremely favorable to the development of the disease, possible infection was reduced on the average to less than one-fifth as judged by untreated controls, which developed on the average nearly 45 percent rot.

Changes in plant-food intake caused by a population of Heterodera marioni (Cornu) Goodey on Ananas comosus, O. C. Magistad and J. M. Oliveira (*Phytopathology, 24 (1934), No. 3, pp. 276–283, figs. 3*).—Sixty young pineapple plants were planted separately in sterilized tubs of soil, half of which were inoculated at planting time with root knot nematodes. Later 15 of each set received mineral fertilizers. Measurements and chemical analyses 6 mo. after planting disclosed the fact that although a complete fertilizer increased the growth rate of the noninfested plants and increased the percentage of nitrogen in both infested and noninfested plants, yet the effect of the nematodes caused a marked reduction in growth and retarded the absorption of nitrogen by 40 to 50 percent.

Stem canker disease of gardenia, P. E. Tilford (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 116, 117, fig. 1*).—Rough, swollen stem cankers near the soil line were found on greenhouse-grown gardenias, stunting and slowly killing the plants. No natural infections have been observed on aerial parts. Black pycnidia of *Phomopsis* type were found half-buried in the cankered cortex, exuding yellowish spore masses under high humidity conditions. Filiform and elliptic-fusiform spores occur in the same pycnidium. The fungus is apparently a weak wound parasite. Destruction of diseased plants, sterilizing of contaminated pots and soil, and avoidance of injury in handling and potting are advised.

A new hollyhock rust, J. J. Taubenhaus and W. N. Ezekiel (*Mycologia, 25 (1933), No. 6, pp. 509–512, figs. 3; abs. in Texas Sta. Circ. 71 (1933), p. 20*).—Common hollyhock rust caused by *Puccinia malvacearum* is not known to occur in Texas on hollyhock or any other malvaceous plants. *P. heterospora* has been found for the first time on hollyhock. This fungus had previously been found in Texas on species of *Sida*. Normal hollyhock plants were successfully inoculated with sporidia of *P. heterospora*.

The inheritance of resistance to rust in the snapdragon, S. L. Emsweller and H. A. Jones (*Hilgardia [California Sta.], 8 (1934), No. 7, pp. 197–211, figs. 6*).—In 1930 seedlings from selfed California snapdragon seed and from rust-resistant Indiana selections were planted out in California. A number of the latter proved highly resistant to *Puccinia antirrhini* and were allowed to be open pollinated. Among the large progenies grown in 1931, several plants remained entirely free from rust, the best of which were selfed or crossed with commercial varieties. In 1932 studies of the progenies showed that resistance was controlled by a single dominant gene. Further crosses and back-crosses disclosed the probable existence of modifying factors in addition to the dominant factor for resistance.

Four strains homozygous for resistance were obtained but proving commercially undesirable were crossed with 15 standard varieties and back-crossed in order to develop acceptable types. The results were very promising.

Tests of the reaction of a number of European species of *Antirrhinum* showed several to be completely resistant.

Growth and injurious effects of Cronartium ribicola cankers on Pinus monticola, H. G. Lachmund (*Jour. Agr. Res. [U.S.], 48 (1934), No. 6, pp. 475–503, figs. 6*).—Growth measurements were made on more than 400 cankers on stems (branches and trunks) ranging up to 8 in. in diameter at 6 different areas in southwestern British Columbia, and observations on injurious effects were made on a much larger number of cankers in the same territory. Size of infected stem and regional site conditions were the predominating influences on canker growth. Vigor of the infected stem was of relatively little importance. Canker growth rates increased rapidly with increasing stem diameters up to from 1 to 2 in. Beyond these diameters the increase was progressively slower until beyond diameters of about 5 or 6 in. the growth rates tended to reach constant maximum levels. Annual longitudinal canker growth in the optimum areas averaged from nearly 4 in. on the smallest twigs to between 9 and 10 in. on the largest branches and trunks, and in areas of shorter growing season and slower growth from about 2 in. to between 6 and 7 in. An average of about 85 percent of the year's growth took place from spring to fall. Downward growth was somewhat more rapid than upward growth, ranging from about 2 to 5 in. per year at the optimum areas and from about 1 to between 3.5 and 4 in. at the areas of slower growth. Lateral growth was about 40 percent of longitudinal growth.

In the smallest stems girdling occurred within a few months during the growing season. Swelling was the rule on stems up to about 5 in. in diameter, beyond which the canker was likely to assume the form of a constriction. In the larger stems the number of years required for girdling approximated the number of inches of stem diameter. The stem is generally killed down to the lower portions of the canker within from 1 to 4 yr. following girdling.

If the canker occurs far enough down on the stem or if the stem is in a weakened condition, the entire branch or trunk may succumb at the time of this first killing or shortly afterward. Otherwise the canker continues its downward growth with further die-back following irregularly behind it. Frequently this progressive die-back takes in the canker itself. In this manner and also through the death of entire branches, owing mainly to the action of the canker and of suppression, great numbers of cankers die out before they can reach the trunk. Dying out of cankers is greatest on the larger trees, but this advantage is offset by the greater amount of infection upon them. Most of the serious injury and killing of trees results from girdling well down on the trunk by cankers that have grown down from the branches.

The data on canker development may be applied to calculating the rate and degree of killing and injury that will result under various conditions.

Poplar canker: A preliminary note, W. R. Day and T. R. Peace (*Quart. Jour. Forestry, 28 (1934), No. 1, pp. 32–43, figs. 2*).—Poplar canker is widespread in Great Britain, and over 12 organisms (fungi and bacteria) have been described as causes. Definitely parasites, most of them attack only hosts in a low state of vigor. The bacterial type is apparently the most serious, but the pathology of poplar canker still awaits satisfactory investigation. The disease does not attack all varieties equally, and most of the good timber-producing varieties can be planted with safety. Frost is the most important nonparasitic agency of canker production, the injury taking the form of die-back of young twigs or the development of small cankers. Numerous susceptible and immune varieties of poplar are mentioned.—(*Courtesy Biol. Abs.*).

A new species of Graphium causing lumber stain, C. T. Rumbold (*Phytopathology, 24 (1934), No. 3, pp. 300, 301, fig. 1*).—According to this contribution from the U.S.D.A. Bureau of Plant Industry, in cooperation with the Forest Products Laboratory at Madison, Wis., *G. rubrum* is frequently found growing on freshly cut sapwood of sweetgum and occurs on other hardwoods and softwoods in forests and lumber yards. The minute hyaline primary conidia are held in a drop of carmine mucous, averaging 200μ in diameter, at the tips of the synnemata, which are dark brown, averaging 780μ in height and 45μ in diameter. Club-shaped secondary conidia, 2μ by 6.5μ, develop on simple erect conidiophores. The mycelium is at first hyaline, but later becomes brown.

Estimation of damage by Merulius silvester [trans. title], F. Kallenbach (*Ztschr. Pilzk., 12 (1933), No. 3, pp. 72–76*).—Three cases are described of work by this fungus in buildings.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report of work with the pea aphid and muskrat by the Maryland Station] (*Maryland Sta. Rpt. 1933, pp. XXIII, XXX, XXXI*).—Brief reference in tabular form is made to the results of spray experiments for the control of the pea aphid in July 1932; and an account is given of a study of the life history and habits and the possibilities of profitable pen raising of the muskrat, conducted at a laboratory at Church Creek. Two species of mites infesting the muskrat on the marsh have been identified as *Tetragonyssus spiniger* and *Listrophorus* n.sp.

The mites occurring in disease-free hive bees [trans. title], H. Homann (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 6 (1933), No. 3, pp. 350–415, figs. 37*).—An extended discussion of the subject, presented in connection with a list of 64 references to the literature.

The deer of California, H. H. Sheldon (*Santa Barbara Mus. Nat. Hist., Occas. Papers, No. 3 (1933), pp. 71, pl. 1, figs. 42*).—This contribution deals with the Rocky Mountain mule deer (*Odocoileus hemionus macrotis*), California mule deer (*O. hemionus californicus*), western mule deer or burro deer (*O. hemionus cremicus*), Columbian black-tailed deer (*O. columbianus columbianus*), southern black-tailed deer (*O. columbianus scaphiotus*), and northwestern white-tailed deer (*O. virginianus ochrurus*). A colored map of ranges and life zones and a classified bibliography of four pages are included.

Winged denizens of woodland, stream, and marsh, A. Wetmore (*Natl. Geogr. Mag., 65 (1934), No. 5, pp. 577–596, pls. 8*).—This contribution, presenting illustrated accounts of 32 additional North American birds, is the seventh in the series (E.S.R., 71, p. 66).

Vulnerability of bob-white populations to predation, P. L. Errington (*Ecology, 15 (1934), No. 2, pp. 110–127, fig. 1*).—This report of studies of the bobwhite, presented in connection with a list of 15 references to the literature, supplements information previously noted (E.S.R., 69, p. 824).

"Winter survival of bobwhite populations under observation appeared—save when overshot, starved out, or decimated by natural cataclysms—largely determined by the carrying capacity of the land, as expressed in terms of coverts habitable for given population levels of birds.

"Kinds and numbers of wild predators, migrant or resident, had no measurable influence on carrying capacity, despite heavy quail mortality sometimes due to predation. Material winter losses from predators have pointed to quail populations topheavy for the environment. Stated otherwise, the predators consume mainly an ill-situated surplus. Material predation upon bobwhite was rather a symptom of species vulnerability than a factor responsible for or even importantly contributory to the low or precarious population densities frequently encountered in Midwest quail range.

"The absolute quail density did not have the close correlation with the rate of winter predation as did comparative density. The density of the population in relation to the carrying capacity of the environment, high or low, was of fundamental significance. The rate of bobwhite population recovery during the breeding season was seemingly conditioned by the degree to which the habitable fall and winter environment was filled up. Progressive increase of environmental resistance was manifest in cases where populations ascended toward levels less and less easily accommodated."

The food of Norwegian grouse chicks (Lagopus lagopus L.), J. Lid and O. Meidell (*Nyt Mag. Naturv., 73 (1933), pp. 75–114, figs. 3*).—This contribution is based upon an examination made of the crop contents of 83 Norwegian grouse chicks collected in Gudbrandsdal Valley, Norway. The localities represented are located in the mountains of south central Norway at an altitude of from 900 to 1,100 m above sea level.

Experiments on the control of the common water leech, Hirudinaria manillensis, Z. de Jesús (*Philippine Jour. Sci., 53 (1934), No. 1, pp. 47–65, pls. 2*).—This is a report of control work with the common water leech, or carabao leech, *H. manillensis* (Lesson) (=*Hirudo boyntoni* Wharton 1913), which is sufficiently abundant in the Philippines to be of considerable economic importance. It attacks not only carabao that wallow in its habitat but also cattle which drink there. Human beings who work in rice paddies or fish in leech-infested places are subject to attack.

It is concluded from control work that "since the 1:50,000 solution is the weakest solution of copper sulfate found to be deleterious to both young and mature *H. manillensis*, a solution of approximately this concentration may be employed in the destruction of leeches in pools and rice paddies by either broadcasting a sufficient amount of the powdered drug on the water or by dragging a bundle containing copper sulfate through the infested water."

A list is given of 14 references to the literature.

The intermediate arthropod hosts of helminth parasites of man [trans. title], M. NEVEU-LEMAIRE (*Ann. Parasitol. Humaine et Compar., 11 (1933), Nos. 3, pp. 222–237; 4, pp. 303–319; 5, pp. 370–402*).—The author first considers the role of the crustaceans, arachnids, myriapods, and insects as intermediate hosts of the helminth parasites of man. An annotated systematic list of the insect and related intermediate hosts of helminth parasites of man and a systematic arrangement of them in tabular form are then presented in connection with a five-page list of references to the literature.

A general textbook of entomology, A. D. IMMS (*London: Methuen & Co., 1934, 3. ed., rev. and enl., pp. XII+727, figs. 624*).—This is a revised and enlarged edition of the work previously noted (E.S.R., 63, p. 844).

Morphology of the insect abdomen, I, II, R. E. SNODGRASS (*Smithsn. Misc. Collect., 85 (1931), No. 6, pp. 128, figs. 46; 89 (1933), No. 8, pp. 148, figs. 48*).—Part 1 of this contribution deals with the general structure of the abdomen and its appendages; part 2, with the genital ducts and the ovipositor.

Some observations on the effect of radio waves on insects and plant hosts, T. J. HEADLEE (*New Jersey Stas. Bul. 568 (1934), pp. 16, fig. 1*).—This contribution reports experiments on the effect of radio waves on insects and plant hosts commenced in 1928 and brought down to the present time. Earlier contributions relating to the subject by the author have been noted (E.S.R., 67, p. 564; 69, p. 230).

The study, the details of which are presented in tabular form, has shown that insects may be killed by exposing them to the lines of force prevailing in an electrostatic field of sufficient power, death resulting from the development of internal heat. It was found that "the lethal degree of internal heat is reached only when heat development within the insect's body greatly exceeds heat radiation therefrom.

"The primary characteristics of the electrostatic field upon which destructive effects on insects depend are frequency, measured in cycles per second, and field strength, measured in volts per linear inch. While with increase of either frequency or field strength, the other factor remaining constant, the speed of the effect on insects is increased (an increase in either involves the use of more current volume), there are frequencies at which the current volume requirements for effective results on insects are much less than at other frequencies. Such frequencies range around 3,000,000 cycles per second.

"Insects respond so much more readily to radio waves than do plants that in many cases insects may be destroyed and plants be left unharmed by the same treatment. The margin of safety between the energy level which will kill insects and damage plants at 3,000,000 frequency is very wide, but the margin of safety between the energy level which will kill insects and plants at 16,000,000 frequency is very narrow. Frequency thus becomes the selective factor in the differential between the effects of lines of force in the electrostatic field on insects and plants. The frequency having been selected, the speed of kill can be varied at will by increasing or decreasing the strength of the field. This is accomplished by varying the current volume input to the electrostatic field.

"Common substances in which insects are feeding have little or no shielding or protective effect against the lines of force in the electrostatic field. The only exception to this rule is water. Water acts as a shield, in that it absorbs the electrical energy. Substances carrying a considerable amount of distributed water, such as soil or sawdust, heat so rapidly that lethal temperatures are reached in the material nearly, or quite, as quickly as within the insect body. Under such circumstances the differential between plant and animal tissue may be lost."

The study is reported in connection with a list of 17 references to the literature.

The amount of residual arsenic on leafy vegetable crops sprayed and dusted with arsenical insecticides, J. N. Samson (*Philippine Agr., 22 (1933), No. 5, pp. 356–371*).—In studies of sprayed and dusted vegetable crops, conducted at the experiment station of the University of the Philippines and here reported, no amount of residual arsenic per kilogram of fresh material was found to exceed the lowest fatal dose for human beings.

Pyrethrum and derris insecticides as arsenical substitutes, R. Hutson (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 241, 242*).—In this practical contribution, attention is called to the value of derris and pyrethrum sprays and dusts. It is pointed out that these materials make effective contact sprays for most soft-bodied insects infesting garden or truck crops and that good results have also been obtained when applied with hand dusters. While at the prevailing prices pyrethrum and derris insecticides cost more than materials hitherto used for the same purposes, this cost is not greatly in excess of that for arsenicals or fluorine compounds, and the danger of residue is entirely eliminated.

Insect findings of recent years which are or may become of interest to nursery inspectors and plant quarantine officers, J. A. Hyslop (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 559–566*).—Notes are given on 41 species of insects that have appeared in the United States in recent years.

[Notes on economic insects] (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 719–724*).—Contributions relating to economic insects and their control include the following: The European Corn Borer in Egypt, by C. B. Williams (p. 719); General Observations on the Lima Bean Vine Borer (*Monoptilota pergratialis* Hulst) on the Eastern Shore of Maryland during 1933, by L. W. Brannon (pp. 719, 720); An Insectivorous Range Lizard in Pasture Insect Control, by G. F. Knowlton (p. 720); *Tortrix ivana* Fernald, a Celery Pest in the Everglades of Florida, by C. O. Bare (pp. 720, 721); The Known Distribution and Habits of *Plectris aliena* Chpn., by E. A. Chapin (pp. 721, 722); Further Observations on Limiting Factors in Codling Moth Bait and Light Trap Attrahency, by J. R. Eyer (pp. 722, 723); The Life Histories of Three Newly Imported Predators of the Red Scale, by S. E. Flanders (pp. 723, 724); and *Trichodes ornatus* (Say), by E. O. Essig (p. 724).

[Work on economic insects and insecticides at the Alabama Station] (*Alabama Sta. Rpt. 1932, pp. 22–24*).—The work under way, briefly referred to, includes control of the cabbage webworm, by J. M. Robinson; control of the cowpea curculio, by F. S. Arant; the life history and control of the pecan weevil, by H. S. Swingle; the control of citrus insects with oil emulsions, by L. L. English; control of purple scale and camphor scale; and oil residue on satsuma foliage.

[Economic insects and their control] (*Peninsula Hort. Soc. [Del.] Trans., 46 (1932), pp. 15–24, 78–112; 47 (1933), pp. 20–28, 35–38, 43–50, 58–60, 75–78*).—Contributions presented at the forty-sixth annual meeting of the Peninsula

Horticultural Society (E.S.R., 67, p. 423) include the following: Insect and Spraying Notes on the Eastern Shore of Maryland for 1932, by S. L. Crosthwait (pp. 15–19); Recent Investigations in Insect Control at the Virginia Truck Experiment Station, by H. G. Walker and L. D. Anderson (pp. 20–24); Results with Some of the Sprays Suggested Recently for Improved Codling Moth Control, by L. A. Stearns, W. R. Haden, and D. MacCreary (pp. 78–88); Orchard Conditions Which Render Satisfactory Summer Control of Codling Moth Impractical, by T. J. Headlee (pp. 89–97); Seasonal History of the Codling Moth, by E. N. Cory (pp. 98–101); Does San Jose Scale Warrant Special Consideration in our Pest Control Program? by H. N. Worthley (pp. 102–106); and An Effective Supplementary Measure for Control of the Plum Curculio on Peach, by L. A. Stearns and W. R. Haden (pp. 107–112).

Contributions presented at the forty-seventh meeting include the following: Experience, during 1933, with Arsenicals and Arsenical Substitutes Applied on Apple for Control of Codling Moth, by L. A. Stearns, D. MacCreary, and W. R. Haden (pp. 20–28); Codling Moth Control in Virginia, by W. S. Hough (pp. 35–38); How the State of New Jersey Meets the Spray Residue Situation, by H. C. McLean and A. L. Weber (pp. 43–50); The Codling Moth Situation on the Eastern Shore of Maryland, by E. N. Cory (pp. 58–60) and The More Important Insect Outbreaks on the Eastern Shore of Maryland, 1933, by S. L. Crosthwait (pp. 75–78).

[Work with economic insects at the Delaware Station] (*Delaware Sta. Bul. 188 (1934), pp. 24–33*).—Important insects of the year are briefly considered by L. A. Stearns; a mosquito survey by Stearns, D. MacCreary, and N. P. Newhouse, the details of which have been noted (E.S.R., 69, p. 81); bionomics and control of the codling moth, a partial report of which is referred to above, and bionomics and control of the grape leaf hopper, of the grape berry moth, and of the oriental fruit moth by Stearns, MacCreary, and W. R. Haden; and a study to determine the factors responsible for the development of one and two annual broods of the plum curculio, by Stearns.

[Contributions on economic insects in Iowa] (*Iowa State Hort. Soc. Rpts., 65 (1930), pp. 92–101, 261, 262, 397–477, figs. 16, 478–498, figs. 3; 66 (1931), pp. 8–18, 213–230; 67 (1932), pp. 84–88, 188–190, 263–274*).—Contributions relating to economic insects presented in the report for 1930 are The Present Status of the Oriental Fruit Moth in the Mississippi Valley, by W. P. Flint (pp. 92–101); Progress Report on Codling Moth Service and Apple Maggot Investigations, by F. D. Butcher, T. A. Brindley, and D. E. Beck (pp. 261, 262); report of the nineteenth annual convention of the Iowa Beekeepers' Association (pp. 397–477); and Report of the State Apiarist, by F. B. Paddock (pp. 478–498); in the report for 1931, Review of Control Measures for Orchard Insects for 1931, by C. H. Richardson (pp. 8–18), and Report of the State Apiarist (pp. 213–230); and in the report for 1932, The Use of Nicotine in the Control of Insects, by C. H. Richardson (pp. 84–88), and Some Lepidopterous Stalk Borers of Ornamental Plants and Their Control, by G. C. Decker (pp. 188–190), both from the Iowa Experiment Station, and Report of State Apiarist, by F. B. Paddock (pp. 263–274).

Insect pests of fruit trees (*[Gt. Brit.] Min. Agr. and Fisheries, Collected Leaflets, No. 2 (1934), pp. [108], figs. [72]*).—The so-called "advisory leaflets" here presented deal with fruit insects and mites of particular economic importance in Great Britain.

Quantitative methods in the study of forest insects, J. J. DE GRYSE (*Sci. Agr., 14 (1934), No. 9, pp. 477–495; Fr. abs., pp. 494, 495*).—The author presents a concise account of some of the outstanding contributions relating to forest

insects selected from the literature, and reports experiments personally conducted in the course of a study of the maple leaf cutter.

The principal insect pests of juniper in Michigan, E. I. McDaniel (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 244–246*).—A brief practical account is given of the more important insect enemies of juniper in Michigan, with suggestions for their control.

The European earwig as a pest in Rhode Island, A. E. Stene (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 566–569*).—A brief account of the European earwig, which first attracted notice as a pest in Newport in 1911, but has not appeared in sufficient numbers outside the city to lead to the application of bait control.

Test house in Panama resists attack of termites and decay (*Wood Preserv. News, 11 (1933), No. 1, pp. 4, 5, 13, figs. 2*).—This contribution relates to a test house built of creosoted and zinc chloride-treated wood that was erected in 1926 on Barro Colorado Island, Canal Zone, Panama, in one of the most severely termite-infested regions known. The house was built in a tropical jungle on the island where 30 species of wood-destroying termites are known to occur, being constructed of treated southern yellow pine. On the last inspection of the building, made by J. Zetek of the U.S.D.A. Bureau of Entomology in October 1932 after 6 years' service, it was found entirely free from decay and termite attack.

The sills, floor joists, and subflooring were treated by the full-cell process with an absorption of 12 lb. of coal-tar creosote per cubic foot. The studding, headers, plates, ceiling joists, and rafters were treated by an empty-cell process with an absorption of 8 lb. per cubic foot. The top flooring, novelty siding, shingle strips, window frames and sash, including inside casing, door frame and door complete, including inside casing, and baseboard and corner boards were treated with zinc chloride, with an absorption of not less than 0.5 lb. of dry salt per cubic foot.

Mormon cricket control in Colorado, E. T. Cowan (*Colo. Agr. Col. Circ. 57 (1932), pp. 28, figs. 16*).—This is a summary of information on control work with the Mormon cricket that has been under way in Colorado in cooperation with the U.S. Department of Agriculture (E.S.R., 62, p. 654).

Experiments with light upon reproduction, growth, and diapause in grouse locusts (Acrididae, Tetriginae), C. W. Sabrosky, I. Larson, and R. K. Nabours (*Kans. Acad. Sci. Trans., 36 (1933), pp. 298–300*).—In work at the Kansas Experiment Station the authors have found that "continuous extra light, either 'violet' or 'white', influences the production in the greenhouse of an anomalous, midwinter generation of the northern grouse locust, *Acrydium arenosum angustum* Hancock. There were no offspring from the controls.

"The growth of nymphs exposed to the special lights was comparatively rapid. The controls, under otherwise practically the same conditions in the greenhouse, grew very slowly during the period of experimentation. The mortality of the controls was significantly greater than that of those exposed to the lights. The higher temperature of the greenhouse breaks hibernation, but special light, in addition, is required to break the winter diapause normal at least for some varieties of the species. There are probably other means, not yet tested, by which the diapause might be broken."

Application of the variance method to the comparison of grasshopper baits, F. T. Cowan (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 705–713*).—This is a contribution from the Colorado Experiment Station and the Office of State Entomologist. The data secured from the experiment reported indicate that salt is not necessary in the grasshopper bait in that State. Amyl acetate appears to be necessary when beet molasses is used, but not of any benefit when

used in combination with cane molasses. The data further indicate that there is no practical substitute for bran, although dried beet pulp appears to have some possibilities.

Procedures responsible for Minnesota's successful grasshopper control campaign, T. L. AAMODT (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 694–702*).—The author here considers the important points relating to the successful grasshopper control campaign conducted in Minnesota in 1932 and 1933.

"About 500 carloads of poison bran bait were distributed to the farmers of the State during the campaign of 1932 and about 45 carloads in 1933. Grasshopper numbers were reduced 90 percent in 55 counties in 1932 and approximately another 6 percent in 1933, leaving approximately 4 percent infestation as compared with the tremendous infestation of 1932. . . .

"An infestation of approximately 5,000,000 acres in 1932 was reduced to approximately 528,828 acres in 1933. Approximately $11,000,000 worth of crops were saved in 1932 and approximately $2,600,000 worth of crops saved in 1933. Bearing in mind that weather conditions have, except for few instances, been entirely in favor of grasshopper development for the past five years, these figures indicate that grasshoppers can be controlled."

Thrips resistance in the onion, H. A. JONES, S. F. BAILEY, and S. L. EMSWELLER (*Hilgardia [California Sta.], 8 (1934), No. 7, pp. 213–232, figs. 4*).—In the introduction to this contribution, the authors briefly review the more important papers relating to plant resistance to sucking insects in connection with a list of 45 references.

Studies of resistance to the onion thrips, in which a comparison was made of the thrips population on domestic varieties and foreign introductions of onions, are reported upon, the details being presented in tabular form.

In observations in 1931 at Davis the conditions were ideal for the rapid increase of thrips, infestation was very severe, and most of the varieties were killed early in the season. One introduction, however, from Persia, here referred to as White Persian, remained green throughout the season and showed no injury. The Spanish types, while showing somewhat less injury than the American, were also killed prematurely.

Of the many varieties and strains of onions observed in 1932 and 1933, White Persian alone had characters that would make further propagation desirable. All varieties were compared with the White Persian, on which the lowest mean number of larvae per plant (4.14) was found.

It is pointed out that the resistance of the White Persian to thrips appears to be determined "by two groups of factors: One, probably, controls those characters that hold the thrips population to a minimum; the other helps the plant to withstand injury. Two, or perhaps three, characters apparently tend to restrict the thrips population—namely, the shape of the leaves, the angle of divergence of the two innermost leaves, and the distance apart of the leaf blades on the sheath column. Probably of considerable importance is the difference in shape of the leaves. In most varieties the leaf blades have a flat side; these sides are face to face and, in the young leaves, closely appressed, protecting the larvae against insect enemies and adverse weather conditions. In White Persian the leaves are almost circular in cross section . . ., reducing protection to a minimum." Other characters help the plants to withstand injury, but these are as yet not well understood.

The account concludes with a brief history of the White Persian variety, introduced by the U.S. Department of Agriculture in 1929 from Persia, its characteristics, and the work of breeding for resistance.

The natural enemies of Aleyrodidae in tropical Asia, C. P. CLAUSEN (*Philippine Jour. Sci., 53 (1934), No. 3, pp. 253–265*).—In this contribution the

author presents a list of host species under each of which are given the various natural enemies that have been found to attack it. The account includes a discussion of the host species, the parasites, the hyperparasites, and the predators.

White wax scale of citrus (Ceroplastes destructor), E. H. ZECK (*Agr. Gaz. N.S. Wales, 45 (1934), No. 2, pp. 88–90, fig. 1*).—An account of an introduced African scale enemy of citrus which also infests many native and introduced shrubs and trees in New South Wales.

On the evolution of aphids, A. MORDVILKO (*Arch. Naturgesch., n.ser., 3 (1934), No. 1, pp. 1–60, figs. 38*).—This discussion is presented in connection with a list of 59 references to the literature.

The balsam woolly aphid Adelges piceae (Ratz.) in Canada, R. E. BALCH (*Sci. Agr., 14 (1934), No. 7, pp. 374–383, figs. 4*).—A brief review is given of the history of *A. piceae* in Europe as it bears on its recent behavior in North America. The infested area and the nature and extent of damage in Canada are described, and an explanation is made of abnormalities caused by the insect.

Control of leafhopper on Florida beans: Combinations of sulphur and pyrethrum dusts prove effective in destroying these " white-fly " insects, D. M. DELONG and N. F. HOWARD (*Fla. Grower, 42 (1934), No. 1, pp. 8, 9, 18, 19, figs. 6*).—This practical account of the findings and control work with the potato leaf hopper on beans in Florida is accompanied by descriptive charts.

An improved technique for the artificial feeding of the beet leafhopper, with notes on its ability to synthesize glycerides, R. A. FULTON and J. C. CHAMBERLIN (*Science, 79 (1934), No. 2050, pp. 346–348, figs. 2*).—In the experiments reported the authors show the beet leaf hopper to be capable of synthesizing glycerides when fed only upon glucose and fructose; they also call attention to an improved technic for feeding such insects upon artificial solutions of known composition. This ability does not continue indefinitely, and its cessation is undoubtedly correlated with the general insufficiency of the pure sugar diet which reflects itself, after a more or less extended time, in those general metabolic disturbances which ultimately result in death.

Correlation between rough-hairy pubescence in soybeans and freedom from injury by Empoasca fabae, E. A. HOLLOWELL and H. W. JOHNSON (*Phytopathology, 24 (1934), No. 1, p. 12*).—The authors conclude that in soybeans, at least with the material under test, freedom from injury by the potato leaf hopper is correlated with the occurrence of rough-hairy pubescence.

The tomato psyllid and the control of psyllid yellows of potatoes, L. B. DANIELS (*Colorado Sta. Bul. 410 (1934), pp. 18, figs. 6*).—This is a brief account of the tomato psyllid (*Paratrioza cockerelli* Sulc.), its importance as the causative agent for psyllid yellows of potatoes and control, a reference to which by List and Daniels has been noted (E.S.R., 71, p. 221). The author deals at length with control experiments commenced in 1932 and greatly extended in 1933 in the Greeley, Florissant, Alamosa, Blanca, Fort Garland, and San Acacia potato sections of the State.

The worst outbreak of psyllid yellows ever experienced in the State took place in 1932. In that year lime-sulfur gave indications of controlling the condition, while no control was obtained from nicotine nor 1 percent Verdol.

In 1933 the lime-sulfur sprays continued to give favorable results. The tests in both early and late fields of lime-sulfur treated plats were consistent in their increase in yield over the untreated fields. In some cases over 200 percent increase in yields was obtained. Two applications were found more satisfactory than one. The concentration of 1 gal. of liquid lime-sulfur to 40 gal. of water was found the most satisfactory.

It is pointed out that spraying must commence very soon after the psyllids appear in the field and that a second application should be applied 2 weeks after the first. In areas where flea beetles and Colorado potato beetles are injurious, 2 lb. of zinc arsenite should be added to each 40 gal. of lime-sulfur solution. On tomatoes the psyllids have been controlled with lime-sulfur spray, 1 gal. to 45 or 50 gal. of water being recommended, since tomatoes are more sensitive to this spray than are potatoes.

Lime-sulfur for tomato psyllid control, G. M. LIST (*Colorado Sta. Bul. 411 (1934), pp. 14*).—This is a report of studies on lime-sulfur for tomato psyllid (*Paratrioza cockerelli* Sulc.) control, early reports of which have been noted (E.S.R., 40, p. 161; 62, p. 55).

The author has found the killing effect of lime-sulfur to come largely from the power of the calcium pentasulfide and calcium tetrasulfide compounds to take up large amounts of oxygen and to give off free sulfur in very finely divided particles. The protection from the psyllids comes in three ways: (1) Lethal effect through contact with their bodies at the time of application, (2) repellent effect upon the egg-laying adults, and (3) residual effect upon the scalelike nymphs that locate upon a sprayed surface.

"Indications of injury to tomatoes and possibly also to potatoes from the use of lime-sulfur have been noted. The strength of the stock material of lime-sulfur should be known and directions for dilution strictly followed. The liquid and dry proprietary lime-sulfur compounds on the market are discussed. They should be evaluated on the basis of the sulfide sulfur content. The commercial liquid lime-sulfur is sufficiently standardized that the recommendation of 1 part to 40 parts of water for potatoes, and 1 part to 45 or 50 parts for tomatoes, can be followed. It takes approximately 5 lb. of dry lime-sulfur to supply the amount of sulfide sulfur in 1 gal. of the commercial liquid concentrate. The dry should therefore be used at the rate of 1 lb. to 8 gal. of water for potatoes and 1 lb. to 9 or 10 gal. for tomatoes."

Blood sucking among phytophagous Hemiptera, R. L. USINGER (*Canad. Ent., 66 (1934), No. 5, pp. 97–100*).—A brief discussion of this subject, presented in connection with a list of eight references to the literature.

The bed-bug: Its habits and life-history and how to deal with it, B. F. CUMMINGS, rev. by E. E. AUSTEN (*Brit. Mus. (Nat. Hist.), Econ. Ser. No. 5, 3. ed., rev. (1932), pp. 27, figs. 7*).—This is a third edition, revised, enlarged, and partly rewritten, of the work previously noted (E.S.R., 39, p. 763).

Entomological investigations on the spike disease of sandal.—XVIII, Fulgoridae (Homopt.), N. C. CHATTERJEE and M. BOSE (*Indian Forest Rec., 19 (1934), No. 8, pp. 14, figs. 2*).—This contribution is in continuation of those previously noted (E.S.R., 71, p. 69).

The irresistance of caterpillars of Loxostege sticticalis L. and Pieris brassicae L. to parasites [trans. title], K. LARTSCHENKO (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 5 (1933), No. 3–4, pp. 679–707, figs. 13*).—This contribution is presented in connection with a list of 32 references to the literature.

Cactoblastis cactorum: Government's policy with regard to distribution of the insect, F. W. PETTEY (*Farming in So. Africa, 9 (1934), No. 97, pp. 138, 139, 150, figs. 2*).—This is an account of the use of the pyralid *C. cactorum*, liberated some 7 yr. ago, for clearing lands of the pricklypear weed pest in Queensland, the results from which are reported as continuing to be phenomenal. Based upon the progress of this insect in Australia, it is to be expected that in the Union of South Africa most of the pest pricklypear plants will be killed within 3 to 5 yr. after they have become infested. It is said that during 1933 thousands of larvae of *C. cactorum* were used for extensive economic food tests in Pretoria.

Observations on the behaviour of newly hatched codling moth larvae, J. A. Hall (*Canad. Ent., 66 (1934), No. 5, pp. 100–102*).—Notes are presented on young codling moth larvae observed from the time of hatching until they became established in the apples or were lost or dried.

The codling moth in South Carolina, W. C. Nettles (*South Carolina Sta. Bul. 295 (1934), pp. 30, figs. 8*).—This contribution includes a popular section (pp. 3–19) and a technical section (pp. 20–29).

The investigational work reported deals with orchard spray tests, the economic aspects of spraying, the efficiency of banding, the role of parasites in control, and aspects of cultivation in control. The addition of fish oil (1 qt. to 50 gal. of arsenate of lead spray) was found to increase control from 47 percent without, to 70 percent, of uninjured apples. Arsenate of lead when applied after the first brood did not reduce the moth population of Golden Delicious apples as well as 2 percent summer oil emulsions, but from the standpoint of cost and efficiency it has not been surpassed. Calcium arsenate was considerably less efficient than arsenate of lead, 2 lb. of hydrated lime to 1 lb. of calcium arsenate being sufficient to buffer the particular batch and prevent burning. Tannic acid 1 lb. to 50 gal. plus Nicotine 50 at the rate of 0.5 pt. to 50 gal. gave considerable control but is considered unsuitable for use under South Carolina conditions. Bands were only about 10 percent efficient but were tested under the most adverse conditions.

It is pointed out that while codling moth control is primarily an insecticidal problem, parasites constitute an important check on increases in population of the insect. Studies conducted during the preceding 4 yr. indicate that *Trichogramma minutum* Riley and *Ascogaster carpocapsae* (Vier.) account for the major portion of the parasitism, the former being unquestionably the more important under natural conditions. Parasitism of codling moth eggs at Clemson College by *T. minutum* rose in 1931 from 17.4 percent for the first brood to 67.5 percent for the third brood, and in 1932 from 19.3 percent before release to 62.4 percent after release for the first brood to 83.3 percent for the second and third broods. Parasitism by *A. carpocapsae*, which represented about 99 percent of the total larval parasitism during normal years, was found in 1931 to range from 3.33 percent on June 6–9 to 9 percent at the close of the month and 8 percent on July 27–29.

The burying of larvae and pupae under varying depths of soil at Clemson College in 1932 has shown cultivation to be most effective if practiced when the major portion of the spring brood is in the pupal stage. While the best time to cultivate is just before apples are in bloom, almost as much will be accomplished by earlier cultivation since only a small percentage of larvae are able to emerge from under even 3 in. of soil.

Colorado and Virginia strains of codling moth in relation to their ability to enter sprayed and unsprayed apples, W. S. Hough (*Jour. Agr. Res.* [*U.S.*], *48 (1934), No. 6, pp. 533–553, fig. 1*).—This contribution from the Virginia Experiment Station after reviewing earlier work on the subject, including that of the author (E.S.R., 59, p. 459; 61, p. 155), reports upon investigations conducted from 1929 to 1933, the details of which are given in tabular form.

It is pointed out that larvae from Colorado and native Virginia larvae have been reared and studied under the same climatic environment in Virginia for 7 yr. While the seasonal history of the pest in the Grand Valley of Colorado and the Shenandoah Valley of Virginia is essentially alike, the insect has been much more difficult to control in Colorado.

"Colorado larvae reared under Virginia climatic conditions since 1928 have consistently demonstrated a distinct superiority over Virginia larvae in their

ability to enter sprayed fruit. Great ability of the Colorado larvae to enter sprayed fruit was not specific for lead arsenate, but was also demonstrated when such nonarsenical sprays were used as cryolite, barium fluosilicate, rotenone, cuprous cyanide, and nicotine. . . . Colorado larvae of the second instar were slightly superior to Virginia larvae in ability to enter unsprayed and sprayed fruit. Larvae of Colorado and Virginia strains were most successful in entering unsprayed fruit, as well as sprayed fruit, when the temperature was relatively high than in cooler weather. Larvae of the *Colorado strain under all conditions were consistently more successful than Virginia larvae in entering unsprayed fruit.* Careful observations on the habit of rejecting apple tissue while entering the fruit failed to reveal any difference in habit of entering that could be used to explain the difference in survival of the Colorado and Virginia larvae under observation. By actual count the number of rejections made by the Colorado larvae did not exceed those made by the Virginia larvae. . . .

"*Colorado larvae endured starvation more successfully than Virginia larvae.* The percentage of survival increased for both strains when the larvae were starved during cool weather in comparison with survival when the temperature was relatively high. . . .

"The essential difference in the strains was demonstrated in the partially developed embryo, was most marked in the fully developed embryo and the newly hatched larvae, and disappeared to a large extent in the full-fed larvae. The difference seems to be one of general vigor, or power of recovery, inherent in the individual. *This investigation demonstrates the existence of different strains of the codling moth in which the young larvae vary greatly in vigor.* By rearing the larvae continuously on freshly sprayed fruit in the laboratory, it was possible to increase in a strain the proportion of individuals which possessed more vigor, with the result that a greater percentage of the young larvae entered and injured sprayed apples. Difference in vigor appeared in the well-developed embryo and was most marked in the fully developed embryo and in newly hatched larvae. *It was also quite evident in larvae of the second* instar but had disappeared to a large extent in the full-fed or mature larvae."

Arsenic deposit and codling moth control, R. L. Webster and J. Marshall (*Washington Sta. Bul. 295 (1934), pp. 51, figs. 16*).—Reporting further upon the status of codling moth control (E.S.R., 71, pp. 75, 343), it is pointed out that the protection from worm attack, at least with lead arsenate, depends upon the amount of deposit and the nature of the coverage. The addition of mineral oil or fish oil increases deposit and improves coverage.

"*Fruit sprayed with lead arsenate where mineral oil is used late in the season, a valuable treatment for second brood, often is difficult to clean.* Fruit sprayed with lead arsenate and fish oil has been much easier to clean, especially with sodium silicate, than when mineral oil is used. No special difficulties have been encountered in residue removal when the oil-lead arsenate combination, a spray of utmost importance, has been used in the early cover sprays. Where equal deposits of arsenic were obtained, the manganese arsenate-fish oil combination was much less efficient than lead arsenate alone. Calcium arsenate with soap, even where a smooth cover and a high arsenic deposit were obtained, failed to stop the worms under conditions of heavy infestation. Calcium arsenate with mineral oil (0.5 gal. to 100) resulted in high deposit and good control, with practically no injury to foliage and no residue difficulty when acid washed. Calcium arsenate and fish oil gave high deposit and good control, but severe foliage injury and fruit drop resulted late in the season. High deposits of lead arsenate, built up with mineral oil and oleic acid,

controlled the worms on McIntosh trees, but the lead residue at harvest was extremely difficult to remove. With the same spray schedule throughout the season, Winesaps and Jonathans retained a greater deposit of arsenic per square inch than Delicious or Romes. Varietal differences in susceptibility to worm attack modify generalizations on deposit and its direct relation to control."

A new genus and species of the family Gelechidae (Lepidoptera), A. Busck (*Ent. Soc. Wash. Proc., 36 (1934), No. 4, pp. 82–85, pl. 1*).—The new genus *Cremona* is erected, and under the name *C. cotoneastri* a new species collected from *Cotoneaster horizontalis* in Oregon is described as the type.

Notes on a psychid new to North America (Fumea casta Pallas, Lepidoptera: Psychidae), D. W. Farquhar (*Psyche, 41 (1934), No. 1, pp. 19–29, figs. 3*).—This contribution relates to the distribution and biology of the European casebearer *F. casta*, which was first found in 1931 near Jamaica Pond, Boston, Mass., associated with the beech scale. It has since been discovered to occur in that vicinity over an area of some 50 sq. miles. A second and far removed colony has been found near Germantown, Pa., and a third colony at Worcester, Mass.

Notes on the lesser budmoth, Recurvaria nanella Hbn., F. C. Gilliatt (*Sci. Agr., 14 (1934), No. 9, pp. 466–476, pls. 2; Fr. abs., p. 476*).—An account is given of the life history and habits of *R. nanella* Hbn., which closely resemble those of the eye-spotted budmoth in Nova Scotia.

Additional inspection of nurseries on account of the European pine shoot moth, W. E. Britton (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 572–574*).—A brief account contributed from the Connecticut [New Haven] Experiment Station on the occurrence of the European pine shoot moth, which has been a source of damage to forest plantations of red pine in south central and southwestern portions of Connecticut.

Sugar-cane moth-borer investigations in British Guiana: The present position, L. D. Cleare (*Agr. Jour. Brit. Guiana, 5 (1934), No. 1, pp. 13–21*).—This is a report upon the status of work conducted since July 1931 in British Guiana with the moth borer, represented by the sugarcane borer and *Diatraea canella* Hmpsn. Some of the parasites are known to attack the egg, larval, and pupal stages under the conditions of high rainfall and humidity met with in this colony.

Tortilia viatrix new species, an African moth on senna imported into the United States, A. Busck (*Ent. Soc. Wash. Proc., 36 (1934), No. 3, pp. 68–70, pl. 1*).—The species here described as new was reared from heavily infested sacks of dry senna imported into the United States from Sudan, Africa.

Outbreak of an African moth in stored senna, H. B. Weiss and E. G. Rex (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 557, 558*).—An account is given of the outbreak of *Tortilia viatrix* Busck (see above) in uncompressed bales of senna leaves from Sudan, Africa, that were stored in a warehouse at Hoboken, N.J. Its control was obtained through fumigation for 48 hr. with Carboxide at the rate of slightly over 15 lb. to 1,000 cu. ft. of space.

Studies on the higher Diptera of medical and veterinary importance: A revision of the genera of the subfamily Calliphorinae based on a comparative study of the male and female terminalia, W. S. Patton and E. C. Cushing (*Ann. Trop. Med. and Parasitol., 28 (1934), No. 1, pp. 107–121, figs. 7; 123–130, figs. 4*).—In the first article the authors take up the genus *Lucilia* Robineau-Desvoidy (sens. lat.), giving a short description of the male terminalia of *Lucilia caesar*, the type species for the genus, and beginning short descriptions of the species of *Lucilia*. The second article deals with the genus *Chrys-*

omyia Robineau-Desvoidy (sens. lat.), describing the type species for the genus, *C. marginalis*, and starting descriptions of the species belonging to the genus.

Observations on the life-history, bionomics, and control of the white-fly of cotton (Bemisia gossypiperda M. & L.), M. A. Husain and K. N. Trehan (*Indian Jour. Agr. Sci., 3 (1933), No. 5, pp. 701–753, pls. 6, figs. 5*).—This is a report of studies conducted in Punjab on *B. gossypiperda*, the details of which are given in tabular and chart form. Parasitism in nature was observed to reach a maximum of 33 percent of the pupae during September.

A note on the distribution of Eumerus narcissi Smith (Diptera: Syrphidae), R. Latta (*Ent. Soc. Wash. Proc., 36 (1934), No. 4, p. 80*).—Attention is called to the facts that *E. narcissi* is quite common in bulb districts in California, only one specimen has been found in Oregon, one pair was collected in 1931 in a greenhouse on Long Island, N.Y., and during 1933 a single male was collected at Morning Sun, Iowa, from flowers near a bed of naturalized daffodils.

Egg deposition of the lesser bulb fly (Eumerus tuberculatus Rond.), F. S. Blanton and F. J. Spruijt (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 713–715*).—This account summarizes the oviposition record of *Eumerus* flies confined in test tubes during June, July, and August 1932 at Babylon, N.Y.

A new gall midge on fig (Diptera: Itonididae), E. P. Felt (*Ent. News, 45 (1934), No. 5, pp. 131–133*).—Under the name *Ficiomyia birdi* the author describes a new species of gall midge reared from fruits of a species of figs, *Ficus brevifolia* (*populnea*), growing in the Royal Palm State Park, Fla.

A study of apple maggot control measures, P. J. Chapman and O. H. Hammer (*New York State Sta. Bul. 644 (1934), pp. 40, figs. 17*).—This report of investigations largely on control of the apple maggot, which has been in progress since June 1930, considers measures involving the use of stomach insecticides. The work relating to the killing of the eggs and larvae in picked fruit by refrigeration has been noted (E.S.R., 69, p. 394).

These experiments, conducted in an average of 12 orchards each year from 1930 to 1933, inclusive, have shown that the pest may be controlled by the use of certain stomach insecticides. The work has led to the recognition of lead arsenate as the standard apple maggot insecticide. Calcium arsenate may also give good control, and because it contains no lead and weathers off at a relatively rapid rate, is preferred by some growers. However, it is less effective than lead arsenate and may cause serious foliage injury under certain conditions. "Manganese arsenate, synthetic cryolite, and natural cryolite, as used up to this time, have proved inferior to lead arsenate. Nicotine tannate and nicotine sulfate-ammonium sulfo soap gave essentially negative results in 1933.

"Control is effected by poisoning the adult or fly stage. New flies emerge from the soil daily over a period of about eight weeks, starting June 15 to 25, the date varying with the season and locality. The minimum treatment for apple maggot consists of two lead arsenate sprays, the first to be applied about a week after the beginning of fly emergence and the second at the 'peak' of emergence (July 15 to 25). The dispersal habits of the fly are such that it has been found necessary to spray all trees in an orchard, not neglecting trees in their off-bearing year, and either to spray or remove all apple trees within 150 yd. of a commercial planting."

That it is often difficult to control the pest in small orchards surrounded by woods, buildings, or other shelter is pointed out. In the average commercial planting, the pest may be greatly reduced by thorough spraying. Poor results were obtained in a residential district when apple trees on certain properties were sprayed while those on others remained unsprayed.

The pest may apparently be controlled in plums by the same treatment recommended for it in apples, as indicated by a single orchard experiment.

Frequent association of Phytomonas melophthora with various stages in the life cycle of the apple maggot (Rhagoletis pomonella), T. C. ALLEN, J. A. PINCKARD, and A. J. RIKER (*Phytopathology, 24 (1934), No. 3, pp. 228–238, fig. 1*).—This is a report of studies made at the Wisconsin Experiment Station of *P. melophthora*, the apple rot bacterium, as related to the various stages in the life cycle of the apple maggot.

"The bacteria have been found commonly associated with both male and female adult flies, eggs, larvae, and puparia. They have also been found in the ovipositor punctures, larval burrows, and exit holes in apple-fruit tissue. The bacteria were recovered from adult flies and larvae following treatment with surface disinfectants. This work, based on 244 isolations, 54 percent of which were positive, indicates that these apple-rot bacteria may be frequently associated with various stages in the life cycle of the apple maggot."

Studies on the seed-corn maggot.—III, On the method of control of the seed-corn maggot (1), C. HARUKAWA, R. TAKATO, and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch., 6 (1933), No. 1, pp. 83–111*).—This further contribution (E.S.R., 69, p. 694) on the seed-corn maggot reports control work, the results of which are presented in a series of 29 tables. It is pointed out that some of the experiments reported are as yet of a preliminary nature, and that further experimentation is needed to decide the practical value of the methods which have been tested.

Fly control, T. L. BISSELL (*Georgia Sta. Circ. 102 (1934), pp. 4, figs. 4*).—This is a brief practical account of fly control measures.

Home-made cattle sprays, C. B. DIBBLE (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 243, 244*).—Directions are given for the preparation and application of several fly spray mixtures.

The mosquitoes of Montana, G. A. MAIL (*Montana Sta. Bul. 288 (1934), pp. 72, figs. 18*).—Following a brief introduction and descriptions of methods of collecting and rearing mosquitoes, the author presents a table of 40 species, representing 6 genera, of which 29 belong to the genus *Aedes*. Keys are given for the identification of the adults and larvae of the several genera, followed by descriptions of the species, each of which includes the recognition characters, distribution, life history, and importance. *A. dorsalis* Meig. and *A. vexans* Theo., said to be the two dominant and most widely distributed species in the State, are followed in importance by *A. idahoensis* Theo., *A. increpitus* Dyar, *A. nigromaculis* Ludl., and *A. spenceri* Theo. Observations on the various species of mosquitoes, oviposition habits of *A. vexans* and development of the immature stages, and mosquito control, both natural and artificial, are discussed. A list is given of 23 references to the literature cited.

Contribution to a study of the biology of the races of Anopheles maculipennis [trans. title], L. LA FACE (*Riv. Malariol., 12 (1933), No. 6, pp. 1069–1114, fig. 1; Ital., Fr., Eng., Ger. abs., pp. 1213, 1214, 1216, 1217, 1218*).—A report of experiments conducted by the author in the course of more than two years in Italy.

Flight range of the funestus-minimus subgroup of Anopheles in the Philippines.—First experiment with stained mosquitoes, P. F. RUSSELL and D. SANTIAGO (*Amer. Jour. Trop. Med., 14 (1934), No. 2, pp. 139–157, figs. 3*).—The distance which anopheline mosquitoes can fly is discussed in a general way by the authors, with citations from the literature, a list of 35 references being included. In the first flight experiment in the Philippines here reported, stained mosquitoes of the malaria-carrying species were liberated, some being recap-

tured later at various distances from the liberating point. Of the *A. funestus-minimus* subgroup, *A minimus flavirostis* was recaptured 0.5 km from the liberating point, *A. mangyanus* within 0.9 km of this point, and *A. filipinae* at 1 km from the point. It is concluded that the mosquitoes of this subgroup of King can fly at least 1 km, and that *A. tessellatus* can fly at least 1.8 km.

A list is given of 35 references to the literature.

Index to malaria literature, V, 1930; VI, 1931 [trans. title], G. Tesoni and B. Williams Aurelli (*Riv. Malariol., 10 (1931), Sup., pp. 124; 12 (1933), Sup., pp. 122*).—Part 6 of these indexes (pp. 43–55; 41–52) includes much information on anopheline mosquitoes (E.S.R., 66, p. 455), their biology and relation to malaria transmission.

The blue flea-beetle, H. M. Nicholls (*Tasmanian Jour. Agr., 5 (1934), No. 1, pp. 18, 19*).—This is a brief reference to the blue flea beetle *Haltica pagana*, the larvae of which have long been the cause of injury to strawberries in Tasmania.

The progression factor in the growth of the Japanese beetle (Popillia japonica Newman) (Coleop.: Scarabaeidae), D. Ludwig (*Ent. News, 45 (1934), No. 6, pp. 141–153*).—This subject, the details of which are presented in tabular form, is taken up in connection with a list of 21 references to the literature.

A mymarid parasite of the eucalyptus snout-beetle (Gonipterus scutellatus Gyll.), and its introduction into South Africa, M. C. Mossop (*Union So. Africa Dept. Agr.. Sci. Bul. 81 (1929), pp. 19, figs. 7*).—This is an account of the Australian parasite of *G. scutellatus* that has been introduced into the Union of South Africa.

The southern pine beetle in Pennsylvania (Dendroctonus frontalis Zimm.), J. W. Knull (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 716–718*).—Notes are presented on the southern pine beetle, which has appeared in the southern part of Pennsylvania, where, during the winter of 1932–33, many areas of infestation were located in Franklin, Fulton, and Bedford Counties.

The rice water weevil, D. Isely and H. H. Schwardt (*Arkansas Sta. Bul. 299 (1934), pp. 44, figs. 12*).—This is a summary of investigations by the station, partial accounts of which by the authors have been noted (E.S.R., 66, p. 549; 67, p. 579), presented with a list of 15 references to the literature.

The work was carried on at the Rice Substation, near Stuttgart in Arkansas County, largely from 1930 to 1933, inclusive. The first part of the report relates to the history, morphology, biology, and economic importance, particular attention being given to the seasonal history, with the details presented at length in table and graph form.

Control experiments, the details of which for the 4 yr. are presented in tabular form, have shown the drainage of rice to be a dependable means for increasing rice yields. Among the 40 plats that were drained for weevil control all but one of those without water for a long enough period yielded more grain than the average of the checks for the series. The plats in each series which were drained at the time that appeared to be optimum for the series yielded an average of 17.8 percent more rice than the average of the accompanying checks. Just before severe root pruning began was found to be the best time to apply drainage, as at this time the number of larvae in the third instar was usually greater than those in any other stage. If drainage was applied earlier the yields of rice were usually not maximum. Apparently it was to the advantage of the rice plant to go undrained for as long a period as possible. During summer the optimum time following flooding for beginning drainage was from slightly less than 3 to about 4 weeks. It is thought that for ear

rice the interval can exceed 4 weeks with advantage. It is concluded that delaying drainage as long as possible without injury to the rice plants favors increased yield, that the drainage period should be extended until the soil is thoroughly dried, and that the drying period should not be less than 2 weeks except during periods of extreme drought and high temperature.

List of chalcid flies (Hym.) reared in U.S.S.R., M. NIKOL'SKAYA (*Bul. Ent. Res., 25 (1934), No. 1, pp. 129–143, figs. 3*).—An annotated list of the parasitic and phytophagous species of Chalcididae that have been reared in the U.S.S.R. during recent years, arranged systematically, is followed by a list of hosts of phytophagous species and a list of hosts of parasitic species. Descriptions of three new species of the subfamily Eurytominae are given in an appendix (pp. 141–143).

Two chalcid parasites of the goldenrod gall-fly, Eurosta solidaginis (Hymenoptera: Chalcidoidea; Diptera: Trypetidae, et al.), G. F. HUGHES (*Ent. News, 45 (1934), No. 5, pp. 119–122*).—The chalcid parasites of *E. solidaginis* here considered are *Eurytoma obtusiventris* and *E. gigantea*.

Records of hymenopterous parasites of ticks in the United States, F. C. BISHOPP (*Ent. Soc. Wash. Proc., 36 (1934), No. 4, pp. 87, 88*).—This is a brief reference to records of tick parasites.

On the identities of chalcidoid tick parasites (Hymenoptera), A. B. GAHAN (*Ent. Soc. Wash. Proc., 36 (1934), No. 4, pp. 89–97, fig. 1*).—This discussion, presented in connection with a list of 25 references to the literature, differentiates *Ixodiphagus texanus* How. from *Hunterellus hookeri* How., and points out that *I. caucurtei* Buys., described from France, is identical with and a synonym of *H. hookeri*.

A new species of Cirrospilus Westwood (Chalcidoidea,) A. B. GAHAN (*Ent. Soc. Wash. Proc., 36 (1934), No. 5, pp. 122–124*).—Under the name *C. inimicus* the author describes a new species reared from *Spilocryptus extrematis* (Cress.) infesting *Cecropia* at Hinsdale, Ill.

A contribution to the technique for propagation of Chelonus annulipes Wesm., an imported parasite of the European corn borer, G. WISHART and W. E. VAN STEENBURGH (*Canad. Ent., 66 (1934), No. 6, pp. 121–125, pl. 1*).—This contribution deals entirely with one phase of the rearing of *C. annulipes*, a larval parasite ovipositing in the egg of the European corn borer. It is an important parasite of this pest in Europe, but occurs only in certain localized areas, particularly in northern Italy. An account of the biology and morphology of this parasite by Vance has been noted (E.S.R., 67, p. 582).

Sugar cane moth borer control by Trichogramma minutum Riley.—Report on experimental work for 1933, W. E. HINDS, B. A. OSTERBERGER, and A. L. DUGAS (*Louisiana Sta. Bul. 248 (1934), pp. 34, figs. 4*).—This bulletin, which reports on the progress in 1933 in continuation of the earlier work summarized in Bulletin 235 (E.S.R., 69, p. 80), describes in some detail the methods followed in locating fields for the experiments, how the parasites are released, the records taken and how the benefits secured by the use of parasites have been measured, and just what net profit per acre was secured.

The authors emphasize the fact that the benefits secured from colonization on the average may reasonably be expected to amount to a saving of one-third or more of the loss which would have been suffered under conditions of natural borer and *Trichogramma* development.

Sugar cane borer, W. E. HINDS (*Sugar Bul., 12 (1934), No. 17, pp. 4–6*).—This contribution from the Louisiana Experiment Station, which relates to the work above noted, includes some supplementary information.

Gulf storm checks cane borers, W. E. HINDS (*Sugar Bul., 12 (1934), No. 19, pp. 5, 6*).—Contributing from the Louisiana Experiment Station, the author calls attention to the fact that while the unusually severe tropical storm which swept over much of the Louisiana sugarcane belt June 16, 1934, caused considerable damage to the growing cane, it came at the exact time to check the beginning of the second generation of the sugarcane borer most effectively. A large part of the moths that were active at the time of the storm were destroyed by the severe whipping of all vegetation by the winds and by the heavy driving rainfall. The storm also caused a large proportion of the borer egg batches on the corn and cane at that time to be detached. It is pointed out that "the 'shredding' of corn leaves which occurred in the early maturing corn, where most of the borers were developing, will render that foliage much less attractive to moths for later egg deposition than corn foliage in such fields would be ordinarily."

[Contributions relating to apiculture] (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 596–668, pls. 2, figs. 4*).—Contributions presented before the apicultural section of the American Association of Economic Entomologists at the annual meeting held at Boston in December 1933 include the following: Miscellaneous Problems in Beekeeping, by W. E. Britton (pp. 596–598); Problems in Apiculture, by H. Osborn (pp 598–601); Treating Colonies Affected with American Foulbrood with a Bacteriological Verification, by W. E. Dunham and P. E. King (pp. 601–607); The Weight per Gallon of Honeys from Various Floral Sources, by G. E. Marvin (pp. 608–611); The Net Weight of Combless Packages of Honeybees from the South, by A. W. Woodrow and W. E. Dunham (pp. 611–614); Spray Poison in the Yakima Valley, by R. L. Webster and A. Crews (pp. 614–617); A Method for Measuring Relative Humidity by Means of Thermocouples (pp. 618–624) and The Effect of Colony Size on the Flight Rates of Honeybees during the Period of Fruit Bloom (pp. 624–629), both by A. W. Woodrow; Studies in the Number of Ovarioles in Queen Honeybees in Relation to Body Size, by J. E. Eckert (pp. 629–635); Adult Bees Found Dying on Spotted Loco [*Astragalus lentiginosus*], by G. H. Vansell and W. G. Watkins (pp. 635–637); An Attempt to Study the Effects of Relative Humidity on Honeybees, by D. O. Wolfenbarger (pp. 638–641); Preliminary Studies in the Physical Characteristics of Some Massachusetts Honeybees, by C. R. Kellogg and D. Asquith (pp. 641–647); Planning an Extension Project in Beekeeping, by E. J. Anderson (pp. 648–652); Studies on the Control of Granulation of Iowa Honeys, by E. I. Fulmer, W. Bosch, O. W. Park, and J. H. Buchanan (pp. 652–656); and Studies on the Bacteria Associated with European Foulbrood, by C. E. Burnside (pp. 656–668) (see below).

Further observations on the Haydite hive, L. HASEMAN (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 702–705, fig. 1*).—Contributing from the Missouri Experiment Station, the author reports that beehives made of concrete in which Haydite is used in place of sand and gravel have proved very satisfactory for housing bees. These hives were found favorable for wintering bees and more comfortable in summer than the standard wooden hives. While their weight necessitates the selection of a permanent site for the apiary, the hives are indestructible against fire, weather, decay, termites, rodents, and other agencies that damage standard wooden hives.

Diseases of adult bees, H. M. NICHOLLS (*Tasmanian Jour. Agr., 5 (1934), No. 1, pp. 13–17, figs. 3*).—A brief practical summary of the diseases of adult bees, including that due to *Nosema apis* and to the widespread fungus *Trichoderma lignorum*.

Studies on the bacteria associated with European foulbrood, C. E. BURNSIDE (*Jour. Econ. Ent., 27 (1934), No. 3, pp. 656–668, pls. 2*).—The studies

here reported are presented in connection with a list of 14 references to the literature. The author has found several morphologically different forms of bacteria to be more or less constantly present in honeybee larvae sick or dead of European foulbrood. These forms were not found in larvae sick or dead from other causes.

"No evidence has yet been obtained which satisfactorily explains the etiology of European foulbrood or why these different bacterial forms are constantly associated with this disease. It has been found that *Bacillus alvei* is capable of morphological, cultural, and biological transformation and is also capable of stabilization, at least temporarily, as a sporogenic rod, an asporogenic rod resembling *Bacterium eurydice*, or a coccoid resembling *Bacillus pluton*. There seems to be insufficient reason for assuming that the lancet-shaped bacterial cell, *B. pluton*, found in late stages of infection in European foulbrood, is of [a] different genus and species from the similar form *Streptococcus apis*, which is readily obtained in culture from sick larvae. The identity of *S. apis* and *B. pluton* is suggested by morphological similarity, by the fact that the pointed or lancet shape is a variable character in both forms and appears to be only an expression of restricted growth or dormancy accentuated in infected larvae, and also by the usual, if not invariable, occurrence of *S. apis* in recently infected larvae, and by the fact that typical European foulbrood was produced in Wharton's and in the writer's experiments when young brood was inoculated with cultures of *S. apis* prepared with isolated colonies.

"That *B. pluton* and *S. apis* are variants, or stages in the life history, of *B. alvei* is suggested by the occurrence of variants resembling *B. pluton* in pure cultures of *B. alvei* and by the apparent origin on rare occasions of sporogenic *B. alvei* in cultures *S. apis*. The transformation at room temperature of sporogenic *B. alvei* into an asporogenic nonmotile rod which morphologically, culturally, and biologically is closely allied to *Bacterium eurydice* likewise suggests the identity of these forms."

Concerning the etiology of European foulbrood, the author considers that the evidence now available points more strongly to a pleomorphic organism as the etiological factor in this disease than to the secondary organism theory advanced by White (E.S.R., 44, p. 60).

ANIMAL PRODUCTION

[Experiments with livestock in Alabama] (*Alabama Sta. Rpt. 1932, pp. 19, 21, 22*).—Data obtained in studies with livestock are reported on a protein supplement to white corn for fattening hogs in the dry lot, by J. C. Grimes, W. E. Sewell, and G. J. Cottier; simplified rations for chickens during the brooding, growing, and laying periods, by G. A. Trollope, D. F. King, and C. T. Bailey; and white corn meal, yellow corn meal, skim milk, and ground soybean hay for laying hens, by Trollope and King.

[Experiments with livestock in Delaware] (*Delaware Sta. Bul. 188 (1934), pp. 17, 18, 19–22*).—Results are reported of studies on protein supplements and forage crops for swine, by A. E. Tomhave; utilization of ground soybeans for poultry, breeding for high egg production with special reference to the method of selection of the breeding males, rations for growing pullets, and germinated oats for laying birds, all by Tomhave and C. W. Mumford.

Five years' results on pasture fertilization and rotation management, C. B. Bender (*New Jersey Stas. Bul. 564 (1934), pp. 8, fig. 1*).—Summarizing the results of the first 5 years of this study (E.S.R., 71, p. 79), it was shown that rotation of pastures insured the cattle getting much of the grass when it was from 5 to 6 in. high. Such grass contained more than 16 percent protein

in the dry matter, while the mature grass obtained under the extensive pasture system contained from 6 to 10 percent protein in the dry matter.

The application of at least 300 lb. of sulfate of ammonia per acre advanced the pasture season at least 2 weeks. Grass so treated was more nutritious, palatable, and succulent. Nitrogen fertilization adapted itself readily to rotation management and could be applied before the pasture season began or after a plat had been pastured. Nonnitrogen fertilizers furnished digestible nutrients at a lower unit cost than nitrogen fertilizers. While nontreated pastures produced digestible nutrients cheaper than any treatment, they seldom furnished enough grazing or grazing of good enough quality.

The seasonal variation of the feeding value of certain strains of grasses of the Digitaria species, D. J. R. van Wyk (*Union So. Africa Dept. Agr., Sci. Bul. 126 (1933), pp. 12*).—The seasonal changes in the chemical composition of different strains of *Digitaria* species, one of the chief grasses in the native pastures of South Africa, are given in tabular form.

Minerals in livestock production, J. M. Jones (*Cattleman, 19 (1933), No. 10, pp. 42–53*).—In this article from the Texas Experiment Station the author reviews some of the more recent findings in the feeding of mineral supplements to fattening rations low in lime and phosphorus content.

The nutritive value of the proteins of alfalfa hay and clover hay when fed alone and in combination with the proteins of corn, K. L. Turk, F. B. Morrison, and L. A. Maynard (*Jour. Agr. Res. [U.S.], 48 (1934), No. 6, pp. 555–570*).—Nitrogen metabolism studies with five growing wether lambs were conducted at the [New York] Cornell Experiment Station to determine the digestibility, storage, and biological value of the proteins of alfalfa and clover hays and of the proteins of each hay in combination with corn. The rations were equalized in energy value by the addition of cornstarch and cane sugar.

The average coefficients of apparent digestibility were 50 for the proteins of clover hay, 56 for alfalfa hay, 55 for the clover-corn combination, and 63 for the alfalfa-corn combination. These results were statistically significant. The same relative differences in digestibility were also shown when allowance was made for the metabolic fecal nitrogen and the true digestibility of the ingested protein calculated. There were no marked differences in the percentage of protein stored from the different rations. The average biological values were 81 for clover protein, 79 for alfalfa protein, 80 for clover-corn protein, and 77 for alfalfa-corn protein.

In a test with three lambs, alfalfa hay fed with no starch or sugar had a biological value of 50, while after the addition of starch and sugar the biological value was 72. These findings indicated the influence of the energy content and the plane of protein intake on the biological value of proteins. It also showed that values obtained may depend upon the technic used for their determinations.

The data showed that alfalfa hay is probably *not* deficient in quality of protein for sheep when fed in a balanced diet.

Fat-lamb breeding at the Potchefstroom School of Agriculture, T. A. du Toit (*Farming in So. Africa, 9 (1934), No. 96, pp. 108–110, 118, figs. 7*).—In an effort to retain the desirable characteristics of the Blackhead Persian and at the same time eliminate the uneven distribution of fat and lean in the carcasses, Blackhead Persian ewes were crossed with rams of the Dorset Horn, Oxford, Suffolk, and Southdown breeds.

The undesirable fat tail of the Blackhead Persian was absent in the crossbred lambs. The so-called triangular-cross lambs, namely, Suffolk, Oxford,

and Dorset rams crossed on Suffolk-Persian ewes, had more symmetrical carcasses and were earlier maturing than first-cross lambs.

Skin folds in the Merino sheep.—I, Influence on wool fineness and fibre variability, V. Bosman (*So. African Jour. Sci., 30 (1933), pp. 355–359, figs. 4*).—A study was made at the Grootfontein School of Agriculture to determine the influence of skin folds of sheep on wool fineness and fiber variability. A wrinkly and a plain-bodied type of Merino ram were selected for this work.

It was found that the fleece from a folded animal was less uniform than that from a plain-bodied animal. Of 7,000 fibers measured on the wrinkly sheep, there were 1,250 measuring 22.5μ giving 17.8 percent fiber uniformity. From the plain-bodied animal 2,000 out of 7,000 fibers measured 20μ or 28.6 percent fiber uniformity. Fiber distribution of wool from between skin folds showed a better fit to the normal curve than that from wool taken on the crest of the fold. The same was true of fiber distribution of samples from plain-bodied sheep as compared with samples from wrinkly sheep. Since sheep breeders feel that skin folds are necessary for the production of large quantities of wool per sheep, it remains to be determined whether it is desirable to produce fleeces with more wool and less uniformity or vice versa.

Hogs (*Maryland Sta. Rpt. 1933, pp. XXIX, XXX*).—A comparison of whole and ground rye for pigs on pasture, data from litter contests from 1925 to 1932, and a study of the relation of temperature to ham curing are briefly noted.

Nutritive value of pasture.—X, The utilisation of young grass by swine, H. E. Woodman and D. B. Norman (*Jour. Agr. Sci. [England], 24 (1934), No. 1, pp. 93–104*).—Continuing this series of studies (E.S.R., 69, p. 400), the results are reported of digestion trials with pigs designed to determine the degree to which pigs are able to digest and utilize young grass. Pigs weighing approximately 150 lb. were fed a basal ration, composed of equal parts of corn meal and coarse middlings, and its digestibility was determined. In the two following periods the basal ration was reduced to an appropriate level and definite weights of grass added. Short, leafy grass containing 26 percent of crude protein and 16.7 percent of crude fiber on a dry matter basis was fed during the second period, while during the third period somewhat older grass containing 16.8 percent of crude protein and 19.4 percent of crude fiber was fed.

With the exception of the fibrous material, the pigs did not digest the nutrients of even young grass as efficiently as they did the constituents of the basal diet. The older grass was even less digestible than the young grass. The pigs were able to digest about 85 percent of the organic matter in the meal and only from 60 to 62 percent of that in grass. On the basis of the results obtained, it was concluded that it would require from 6 to 7 lb. of grass to replace 1 lb. of meal.

The significance of these results in relation to the feeding of pigs on pasture is discussed. A comparison was made of the ability of sheep and pigs to digest young grass.

Comparative studies of rations for weanling pigs, E. W. Crampton (*Macdonald Col., McGill Univ., Tech. Bul. 12 (1933), pp. 23*).—The results of six comparative feeding trials are presented, four of which dealt with the composition and nutritional value of a mixed protein-mineral supplement for hogs, and two with comparisons of oat groats with corn as basal feeds for weanling pigs. The protein-mineral supplement was composed of tankage, fish meal, linseed meal, steamed bone meal, ground limestone, salt, and ferric oxide 40 : 20 : 20 : 10 : 7.6 : 2 : 0.4.

On the basis of feed required per 100 lb. of gain, the mixed supplement was bout 2 percent less valuable than powdered skim milk for weanling pigs.

Adding cod-liver oil to the supplement did not increase its efficiency. The complete substitution of alfalfa hay for the limestone and the partial replacement by Provendeine had no measurable or visible effect upon its efficiency. Rations containing oat groats were about 7 percent more efficient on the basis of feed requirements per 100 lb. of gain than the corn mixtures.

Cottonseed meal for pigs, W. L. ROBISON (*Ohio Sta. Bul. 534* (*1934*), *pp. 44, figs. 6*).—Continuing this study (E.S.R., 67, p. 591), it was found that pigs were from five to seven times more susceptible to cottonseed meal injury than were rats. Adding minerals or minerals and ground alfalfa failed to overcome the toxic effects of a ration of yellow corn and cottonseed meal. The mortality on such rations was as high as 55 percent.

Pigs on a vitamin A deficient ration of white corn, cottonseed meal, tankage, cottonseed oil containing a vitamin D concentrate, and minerals began showing the effects of a lack of vitamin A after 24 to 31 weeks of such feeding. The symptoms were distinctly different from those of cottonseed meal injury and disappeared when yellow corn was substituted for the white corn and cod-liver oil replaced the cottonseed oil. A ration of yellow corn, cottonseed meal, ground alfalfa, minerals, and cod-liver oil carrying an abundance of vitamin A produced the characteristic cottonseed meal injury and caused the death of three out of eight pigs.

A cottonseed meal made by a special process showed a low toxicity as compared with that of meal made by the usual process. Moistening and autoclaving cottonseed meal at 14 lb. pressure for 1 hr. destroyed or reduced its toxicity. Treating for 30 min. by the same method was not sufficient time to make the meal entirely safe for feeding. There was some evidence that iron sulfate in solution prevented cottonseed meal injury.

Cottonseed meal, which was toxic when fed as the only protein concentrate at levels of from 18 to 22 percent, caused no injury when fed at levels of 10.5 percent in rations containing some tankage. Such meal, even at 20 percent levels, when fed with tankage did not cause deaths. There were indications that soybean oil meal may have the same beneficial effect as tankage in rations containing cottonseed meal. The favorable results with autoclaving or through the use of iron solution indicated that, unless the proteins of cottonseed meal are changed, something other than the inadequacy of the proteins in the meal was necessary to account for the injurious effect sometimes resulting from cottonseed meal feeding. A tentative hypothesis was formulated on the basis that when tankage or a similar protein concentrate was fed, the gossypol of the cottonseed meal combined with the proteins of the concentrate in the digestive tract to form an insoluble harmless material.

In practice less cottonseed meal would be fed if tankage or other protein concentrate was included in the ration, and this would thus increase the margin of safety. Pastures reduced the amount of protein supplement required, and the protein and iron furnished by pastures tended to overcome the toxicity of the meal. On this basis, pigs receiving the untreated cottonseed meal as the chief supplement should be on a good pasture as much as possible.

Wintering draft colts, R. S. HUDSON (*Michigan Sta. Quart. Bul.*, *16* (*1934*), *No. 4*, *pp. 236–241*, *fig. 1*).—Continuing these studies (E.S.R., 69, p. 568), two lots of 2- and 3-year-old western draft colts were fed from October 18 to March 4 in a field with an open shed for shelter. The average daily ration in lot 1 was 4 lb. of alfalfa hay, 2 lb. of whole oats, and approximately 17.3 lb. of ear corn in bundles. In lot 2 the colts received 4 lb. of alfalfa, 2 lb. of oats, and 14.6 lb. of ear corn plus the shredded stalks from which the corn had been husked. Hogs were placed in both lots to clean up the refuse corn. They produced a total of 262 lb. of pork in lot 1 and 145 lb. in lot 2. During this

period the colts in lot 1 gained an average of 169.2 lb. per head and in lot 2 135 lb. per head.

From March 5 to April 11 the colts were stabled in single stalls and broken to work. The ration during this period consisted of from 1 to 1.5 lb. of a mixture of oats and ear corn 1:2 per 100 lb. of live weight and 0.5 lb. of mixed timothy and alfalfa hay per 100 lb. of live weight. In lot 2 the grains were crushed, otherwise the rations were the same. During this period lot 1 failed to gain, while lot 2 gained 45 lb. per head. At the end of this period the colts sold for an average price of $76.18 per head, but the total cost per head at this time was $98.81.

It was concluded that corn fed in stalks or with shredded fodder was not a satisfactory feed for growing colts since they refused to eat stalks and wasted large amounts of corn. When such feeds are used they should be supplemented with legume hay and oats. Coarsely grinding grain increased the rate of gain. Western colts were not as good eaters nor as easily handled as native colts.

Poultry production, W. A. Lippincott, rev. by L. E. Card (*Philadelphia: Lea & Febiger, 1934, 5. ed., rev., pp. X+17-723, pls. 2, figs. 236*).—This is the fifth edition, thoroughly revised and enlarged, of the treatise previously noted (E.S.R., 57, p. 868).

Hatching, brooding, rearing, and feeding chicks, M. C. Herner (*Manitoba Dept. Agr. and Immigr, Ext. Bul. 101 (1934), pp. 27. figs. 12*).—An attempt has been made to relate facts as revealed by science as to methods and practices of incubation, brooding, and general care and management of chicks which, if followed, would be practical, economical, and successful.

The comparative nutritive value of sorghum grain, corn, and wheat as poultry feeds, L. F. Payne (*Kansas Sta. Bul. 268 (1934), pp. 32, figs. 4*).—Using White Leghorn chicks, a preliminary test and two experiments were undertaken to compare the relative feeding value of sorghums with corn and wheat as feeds for poultry. Since kafir and milo are more extensively grown than other sorghums, attention was centered primarily on these grains.

In feed consumption the difference between the maximum and minimum amount during the experimental periods of 9 mo. was only 3 lb. per bird. The amount eaten agreed fairly well with the number of eggs produced. It was evident that, when fed in all-mash rations, kafir, milo, white corn, and equal parts of yellow corn and wheat were equally palatable. The differences in the ability of the various rations to maintain body weight were so small that they were not significant. The greatest difference in egg production for the two tests was 9.8, while the probable error of the difference for the two means was 2.8. In one experiment the hatchability of eggs in the kafir lot was exceptionally low, otherwise there was no significant difference in hatchability. For the two experiments the mortality of adult birds in the kafir and white corn lots was 23 percent, for milo 29 percent, and for yellow corn and wheat 35 percent.

It is concluded that good quality kafir or milo could replace either white or yellow corn pound for pound in rations for growing chicks or laying hens if properly supplemented with other nutrients. Appended are recommendations for rations for feeding grain sorghums to chickens.

Feed consumption studies based on the six Maryland egg-laying contests, R. H. Waite (*Maryland Sta. Bul. 359 (1934), pp. 291-330, figs. 5*).—Based on data collected from the records of six Maryland egg-laying contests, it was found that White Leghorn hens consumed 80.5 lb. of feed per head per year, Barred Plymouth Rocks 88.7 lb., and Rhode Island Reds 92.2 lb. The Leghorns

produced 1 doz. eggs for each 4.8 lb. of feed consumed, the Barred Rocks for each 5.7 lb., and the Rhode Island Reds for each 6.1 lb.

The evidence seemed to indicate that Leghorns weighing between 3.8 and 4.2 lb. and Barred Rocks and Rhode Island Reds at 5.5 lb. body weight were the most efficient producers. With one exception the Leghorns that produced 200 or more eggs were above the average weight for the breed. A definite positive correlation was noted between efficiency of production and total production. The two rations used in the contests did not alter the efficiency of production. The data relating to birds that died while in the laying pen indicated that aside from the loss of the value of the bird itself there was little loss in economic efficiency over the period the birds remained alive.

At current prices Leghorns produced eggs at a cost of 8.3 ct. per dozen on a "meat scrap ration" and 8.7 ct. on a "meat scrap, dried skim milk, and cod-liver meal ration." The Rhode Island Reds produced 1 doz. eggs at a cost of 10.8 and 10.9 ct. and the Barred Rocks at 10 and 10 ct. on the respective rations.

Feed consumption and growth of White Leghorn chicks in batteries, C. S. PLATT (*New Jersey Stas. Circ. 316 (1934), pp. 4*).—Tables are presented showing the age, amount of feed consumed per bird for the age in weeks, the total feed consumption, and estimated cost of feed per bird of White Leghorn chicks of both sexes in batteries. The data were collected at the station poultry farm over a period of several years.

Shall the chicks and growing pullets be ranged or confined? D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 85–93*).—On the basis of 4 years' results and experiences at both the Northeastern Experiment Farm at Strongsville and at Wooster, it is felt that it would be extremely hazardous to brood chicks or pullets in confinement or in batteries if they are to be exposed later to disease or parasite-contaminated soil or similar infections. If chicks are to be placed on contaminated soils or in contaminated premises, they should be exposed as soon as possible after they are 2 weeks old in order to permit them to acquire resistance to the infections at an early age. There was a slightly higher percentage of range paralysis among layers raised on fresh range and in confinement than among those raised on contaminated soil, but on the whole the extent of paralysis was practically the same regardless of the method of management.

It is suggested that special breeding, selection, feeding, and management for the development of breeds resistant or immune to some of the more serious causes of mortality hold more promise for the solution of the problem than the management of chicks and pullets.

The effect of confinement brooding on growth and egg production, G. D. BUCKNER, J. H. MARTIN, and W. M. INSKO, JR. (*Kentucky Sta. Bul. 346 (1934), pp. 16, figs. 7*).—In this study three lots of 120 White Leghorn chicks each were brooded and raised according to three different methods. Lot 1 was raised in a colony brooder house with access to bluegrass range and direct sunlight, lot 2 was kept in a battery brooder for the first 3 weeks and then transferred to the colony house, and lot 3 was kept in a battery brooder for 22 weeks. All lots received the same ration.

The three methods of management showed no great differences in rates of growth obtained. The average weight of the cockerels was greater and the average weight of the pullets less at 24 weeks of age than weights previously obtained for corresponding sexes and ages of the same breed. Both pullets and cockerels in lots 1 and 2 were more vigorous, active, and healthier than the corresponding sexes in lot 3, and more and larger eggs were laid during the winter

period and during the pullet year. The cockerels in lot 3 developed larger combs and smaller testes than those in lots 1 and 2, and the mortality during the first laying year was greater in lot 3 than in the other lots. There was no significant difference in the fertility or hatchability of the eggs laid in the three lots.

A comparison of some vitamin A supplements for chick feeding, M. W. Miller and G. E. Bearse (*Washington Sta. Bul. 292 (1934), pp. 20, figs. 5*).—The Western Washington Experiment Station conducted three trials with White Leghorn day-old chicks to determine whether alfalfa products could be used as a source of vitamin A for poultry feeding. The same basal mash supplemented with various products was fed throughout the tests.

Commercial dehydrated alfalfa was found to contain twice as much vitamin A as a sample of commercial sun-cured alfalfa. Local dehydrated alfalfa contained four times as much vitamin A as the same hay sun-cured. The dehydrated alfalfas used in these tests were 30 times more potent in vitamin A than the yellow corn used. Dehydrated Italian ryegrass had as much vitamin A as dehydrated alfalfa. After 1 year's storage the commercial dehydrated alfalfa still had twice as much vitamin A as the commercial sun-cured alfalfa, and the local dehydrated alfalfa was still four times as potent as the same hay cured in the sun. Dehydrated grass lost its potency more rapidly than the alfalfa. Dehydrated carrots had approximately the same vitamin A potency as the dehydrated alfalfa and grass.

The quantities of vitamin A required by pullets for maintenance and egg production, R. M. Sherwood and G. S. Fraps (*Texas Sta. Circ. 71 (1933), pp. 21, 22*).—The amount of vitamin A fed to three lots of Leghorn pullets for 6.5 mo. was varied by the amount of yellow corn and white corn included in the ration. The average daily consumption of vitamin A in the yellow corn lot was approximately 270 units, in the mixed corn lot 120 units, and in the white corn lot none. The first lot had the lowest mortality, maintained the heaviest body weight, laid the most eggs, and these eggs maintained their vitamin A content longer than the other groups. The mixed corn lot was intermediate between the yellow corn and white corn lots in the above respects. The mortality of the white corn lot was 89 percent during the course of the experiment.

In this work laying pullets required approximately 105 units of vitamin A per head per day for maintenance and 6.3 units above maintenance to store 1 unit in the eggs. On this basis it was found that the rations commonly used in this country do not supply sufficient vitamin A for maintenance and egg production unless access to growing green feed or to a vitamin carrier is supplied.

Vitamin D content of egg yolk, H. D. Branion, T. G. H. Drake, and F. F. Tisdall (*U.S. Egg and Poultry Mag., 40 (1934), No. 7, pp. 20–22, 54, 56, 57*).—In tests at the Ontario Agricultural College, eggs were collected from various groups of 14 Barred Plymouth Rock pullets each, receiving the same basal diet. Lot 1 of the group received the basal diet only, while the remaining lots received in addition 2 percent of cod-liver oil, 5x cod-liver oil, 1x viosterol, 100x viosterol, and 10,000x viosterol, respectively. The birds were confined in batteries indoors in January, and the eggs laid by each group during the first 2 weeks of August were collected for assay by the official line test technic of Steenbock and Black (E.S.R., 54, p. 489).

The assay showed the number of Steenbock units per average egg yolk in the respective lots to be 3.8, 30, 57, 30, 818, and 18,000. The addition of small amounts of vitamin D supplement were efficiently transferred to eggs, while massive doses were inefficiently transferred. This inefficiency of transfer sug-

gests some differences in the physiological process underlying the transfer of small and large doses of irradiated ergosterol in the hen's body.

Varying amounts of vitamin D in the form of eggs from hens fed large doses of irradiated ergosterol were fed to chicks on rachitogenic diets. The results of the determination of the ash in the leg bones of these chicks confirmed the relative inefficiency of irradiated ergosterol as compared with cod-liver oil for furnishing vitamin D to chicks. It appeared that the physiological process involved in the metabolism of irradiated ergosterol and its transfer to eggs did not increase its ability to prevent rickets in chicks. The data reported indicated the nonidentity of antirachitic agents in cod-liver oil and irradiated ergosterol.

The influence of some factors on the hatchability of the hen's egg, D. C. WARREN (*Kansas Sta. Tech. Bul. 37 (1934), pp. 42, figs. 3*).—The information in this bulletin is based on a large volume of data accumulated over a period of years dealing with the factors affecting the hatchability of the egg. Most of the factors were largely environmental, either internal or external, although a few were inherent.

A tendency was found for hatching quality to decrease as the age of the female producing the egg increased. There was no evidence that the age of the male influenced the hatchability of the egg he fertilized. The hatchability of eggs was not impaired by heavy egg production. The eggs of pullets that paused previously to the hatching season had a higher hatchability than those laying continuously throughout the hatching season. Close inbreeding had an adverse effect upon hatching quality, while outcrossing improved it. Hatchability percentages varied inversely with the size of the egg. Holding eggs for more than six days seemed to be detrimental under the conditions of this experiment. There were indications that low temperatures under certain conditions before placing eggs in incubators had an adverse effect on hatching quality.

The relation between abnormal orientation of the 4-day embryo and position of the chick at hatching, J. R. CAVERS and F. B. HUTT (*Jour. Agr. Res. [U.S.], 48 (1934), No. 6, pp. 517–531, figs. 3*).—At the Minnesota Experiment Station a study was made of the abnormal orientations of young chick embryos and their possible effects on the subsequent position of the chicks within the egg. A total of 4,721 embryos was accurately determined by candling without breaking the shell at 84 to 90 hr. of incubation.

It was found that 75 percent of the embryos lay within 45° right or left of a line at right angles to the long axis of the egg and with their heads to the left when the small end of the egg was directed away from the observer. With embryos originally normally oriented the mortality rate was significantly lower than that for the remaining embryos. Early abnormal orientation apparently had no marked adverse effect on viability of the embryo until the last 4 days of incubation. The malposition in which the body was upside down with head in the small end of the egg was five times as frequent among embryos which had been oriented toward the small end of the egg on the fourth day as among those then normally oriented. When eggs with embryos originally oriented within 37.5° of the small end of the egg were incubated in a tilted position with the large end up, the malposition head-in-small-end was reduced to 1.9 percent as compared with 9 percent for similar eggs incubated in a horizontal position. Tilting did not materially reduce the frequency of malpositions among embryos having other initial orientations. Four of the malpositions observed appeared to be independent of the original orientation.

The authors suggest that normal orientation of the embryo has been evolved and established due to the greater survival value given to the embryo.

The value of dried skimmilk in feeding ducklings, D. H. Horton (*Poultry Item, 36 (1934), No. 8, pp. 5, 10, 11, fig. 1*).—A number of tests were conducted at the N.Y. State Institute of Applied Agriculture, to obtain information concerning the value of milk in the ration of growing ducklings.

When fed from the time ducklings were placed in the brooder until marketed, one feed mixture was sufficient to provide for growth and good quality of meat. A ration containing milk produced a better quality of market duckling than a ration without milk. A ration made up of 15 percent of second-clear flour and 10 percent of dried skim milk was too sticky and was not palatable during the early life of the ducklings. In one test it was proved that it was more economical to feed ducks on the higher priced feeds. Whitefish meal fed at a 10 percent level up to the day the ducks were marketed did not cause any fishy taint in the meat.

Rabbit raising, H. M. Butterfield and W. E. Lloyd (*Calif. Agr. Col. Ext. Circ. 9, rev. (1933), pp. 94, figs. 22*).—A revised edition of the work previously noted (E.S.R., 59, p. 666).

DAIRY FARMING—DAIRYING

[Experiments in dairying in Alabama] (*Alabama Sta. Rpt. 1932, pp. 20, 21*).—Information was obtained on mineral supplements in the dairy ration, by W. H. Eaton, and the preparation of chocolate ice cream, by A. D. Burke.

Growth standards for dairy cattle, A. C. Ragsdale (*Missouri Sta. Bul. 336 (1934), pp. 12, figs. 3*).—Tables and curves are given, presenting the normal growth standards for male and female dairy cattle of the four major breeds, based on data representing various lines of breeding and systems of management and on weights and measurements taken at the Missouri, Kansas, and Iowa Experiment Stations. Curves also show the results of measurements taken in herds of representative breeders and dairy farmers, and these are compared with the normal standards.

Reference is made to data showing that the growing animal uses feed less efficiently with increasing age and indicating that greater economy may be attained by growing the animals more rapidly than is the customary practice. Chronological age is not necessarily an index of physiological and developmental age. It is suggested that the developmental age be used as one of the guides in breeding dairy heifers.

The influence of type of ration and plane of production on water consumption of dairy cows, F. W. Atkeson and T. R. Warren (*Jour. Dairy Sci., 17 (1934), No. 3, pp. 265–277, figs. 2*).—Because water plays such an important part in the nutrition of dairy cows, the Idaho Experiment Station undertook a study to determine the influence of adding a succulent feed to the ration and the influence of plane of production on water consumption. A group of 7 Holstein cows was placed under observation for 4 periods of 3 days each—(1) while dry and receiving no succulence, (2) while dry and receiving succulence, (3) during high production, and (4) during medium production.

The addition of succulence, while not markedly influencing the total water intake, did decrease the amount of free water consumed. Under similar conditions dry cows consumed an average of 73.5 lb. of water daily, medium-producing cows 109.7 lb., and heavy-producing cows 191.4 lb. The ratio of free water to milk was 3.6 to 1 for medium production and 2.3 to 1 for high production. Total water intake averaged 102.6 lb. daily during the dry period, 140.3 lb. for the medium-production period, and 231.4 lb. for the high-production period. The ratio of total water to milk was 5.2 to 1 for medium production and 2.8 to 1 for high production. For the respective periods the ratio of total

water to dry matter consumed was 3.6 to 1, 4.7 to 1, and 5.3 to 1. Subtracting the water in milk from total water made the ratio of the remaining water to dry matter approximately 3.7 to 1 during all periods. The total water requirements of dairy cows under relatively similar climatic and feeding conditions appeared to depend on the water in milk plus a rather definite amount of water per pound of dry matter consumed. The total water per 100 lb. of body weight was practically the same during all periods when the water in milk was subtracted and the same amount of dry matter was ingested.

During the dry period the cows averaged 3.4 drinks during the day and 1.1 during the night, during the medium-production period 3.4 in the day and 1.6 at night, and during high production 5 in the day and 3.4 at night. Of the free water consumed, only 20 percent was taken at night during the dry period, 35 percent during medium production, and 39 percent during high production.

Water requirements of dairy calves, F. W. ATKESON, T. R. WARREN, and G. C. ANDERSON (*Jour. Dairy Sci., 17 (1934), No. 3, pp. 249–256, figs. 3*).—The Idaho Experiment Station studied the water consumption of 30 individually fed dairy calves in connection with other feeding trials. The calves were all started between the months of December and March and continued for 180 days, so that atmospheric temperature was relatively low at the early ages and increased as the calves grew older. The water was supplied in 14-qt. pails, and check records showed evaporation to be a negligible factor.

It was found that the total water requirement of calves was rather definite at various ages up to 6 mo. For calves receiving liquid milk, free water was apparently not important until they were at least 8 weeks of age but became increasingly more important as the calves grew older. After liquid milk was removed from the ration, the calves tended to drink enough more free water to make up for the water in the milk. This made the total water intake about the same as for calves fed liquid milk. The relationship between total water intake, body weight, and dry-matter consumption was quite constant, particularly after the tenth week.

Powdered skimmilk for dairy calves, A. E. TOMHAVE (*Delaware Sta. Bul. 188 (1934), p. 19*).—Results in rearing heifer calves on powdered skim milk are briefly noted.

The effect of specific dietary fats on the blood lipids of lactating goats, H. H. WILLIAMS and L. A. MAYNARD (*Jour. Dairy Sci., 17 (1934), No. 3, pp. 223–232*).—Continuing this investigation (E.S.R., 69, p. 849) at the [New York] Cornell Experiment Station, further studies were made of the amount and distribution of the various lipids in the plasm and cells, as influenced by specific oils and fatty acids, when substituted for starch in a fat-free ration. An extracted grain mixture and regenerated cellulose, together with starch, molasses, extracted yeast, a vitamin A–D concentrate, and a mineral mixture, were used in order to obtain a basal ration as free of fat as possible. The basal diet was fed to six goats approximately 1 mo. along in their lactation. The supplements to the basal ration were butter oil, coconut oil, a mixture of palmitic and stearic acids, and a mixture of oleic and linoleic acids.

On the fat-free diet the total lipids, phospholipids, and total and free cholesterol in the plasma gradually dropped but rose when the fat supplements were added, regardless of the nature of the fat fed. The iodine numbers of the total lipids in the plasma fell while on the fat-free diet, but with the inclusion of fat supplements tended to change in the direction of the iodine number of the fat fed. The various lipid values in the cells tended to remain constant regardless of the ration or the changes in the plasma. The cholesterol in the cells was practically all in the free state, while in the

plasma it was chiefly in the combined form. The blood picture, in general, was similar to that reported for nonlactating animals of other species. The constant withdrawal of blood lipids for the secretion of milk apparently did not alter the essential nature of the changes in these lipids due to changes in the diet.

A study of the phosphorus requirement of dairy cattle.—II, Phosphorus, calcium and nitrogen metabolism of dairy cattle when alfalfa furnishes the principal source of protein, L. W. LAMB, O. B. WINTER, C. W. DUNCAN, C. S. ROBINSON, and C. F. HUFFMAN (*Jour. Dairy Sci., 17 (1934), No. 3, pp. 233–241*).—Continuing this investigation (E.S.R., 70, p. 82) at the Michigan Experiment Station, a study was made of the calcium, phosphorus, and nitrogen metabolism of the animals before calving and during milk production. Lot 1, consisting of 7 animals, was fed a basal diet made up of low phosphorus alfalfa hay (less than 0.2 percent), corn silage, and ground corn. Lot 2, made up of 6 animals, received the basal ration with enough special steamed bone meal to bring the phosphorus content up to 0.41 percent of the dry matter.

Positive balances for phosphorus, calcium, and nitrogen were obtained in both lots previous to calving. Apparently from 10.8 to 12.3 g of phosphorus per day were sufficient for growth and pregnancy from 18 to 30 mo. of age. On the low phosphorus ration the phosphorus balances were usually negative during heavy milk production, even when blood meal was added to the ration. However, when the ration was supplemented with bone meal the phosphorus balances were positive. The utilization of food phosphorus was more efficient on the low phosphorus ration than on the high phosphorus ration. Metabolism studies were often prevented in the low phosphorus lot due to the lack of appetite of the animals for roughage.

The comparative effectiveness, in the dairy ration, of supplements of phosphorus in the form of orthophosphoric acid, monosodium, disodium, trisodium phosphates, and bone meal, W. A. TURNER, E. B. MEIGS, E. A. KANE, L. A. SHINN, and W. S. HALE (*Jour. Agr. Res. [U.S.], 48 (1934), No. 7, pp. 619–630, figs. 2*).—The U.S.D.A. Bureau of Dairy Industry conducted two studies to determine the effect of variations in alkalinity of a ration on the calcium and phosphorus metabolism of cows and the form in which supplements of phosphorus could be best supplied. The results of the first experiment were somewhat upset due to hot weather and the annoyance from flies which reduced the feed consumption.

It was found that dairy rations of alfalfa hay and grain often have rather large proportions of calcium as compared with phosphorus. The results of these studies showed that the calcium and phosphorus balances of cows fed such rations may often be made more positive by the addition of orthophosphates. When the nearly neutral phosphates, disodium and monosodium, phosphate, were added, the improvement was more marked than when orthophosphoric acid or trisodium phosphate was used. Increasing the amount of calcium and phosphorus in the ration of cows was likely to be followed by more positive calcium and phosphorus balances, while decreasing had the opposite effect. There was reason to believe that considerable quantities of calcium and phosphorus were retained as insoluble tricalcium phosphate in the intestinal tract for several weeks. There is no method of determining what proportion of the calcium and phosphorus balances is to be explained by this condition and what proportion represents a gain in bone tissue.

It is concluded that changes in the balances following large changes in calcium and phosphorus intake, and of only a few weeks' duration, should not be taken as certain indications of differences in the assimilation of calcium and phosphorus from the intestinal tract.

The relation of phosphorus deficiency to the utilization of feed in dairy cattle, W. H. Riddell, J. S. Hughes, and J. B. Fitch (*Kansas Sta. Tech. Bul. 36 (1934), pp. 54, figs. 7*).—Continuing this study (E.S.R., 71, p. 286), the observation of the previous investigators that a shortage of phosphorus in the ration became a limiting factor in economy of feed utilization was substantiated.

A phosphorus deficiency did not depress the digestive functions of the animal. Even lactating cows in a condition of aphosphorosis digested their feed as completely as the normal control. No abnormal losses of energy could be demonstrated in the excreta of phosphorus-deficient animals by means of gross energy determinations of the feed and visible excretions. Oxygen consumption measurements of phosphorus-deficient animals indicated a higher energy metabolism. The failure in appetite of animals in a low phosphorus condition was not sufficient to explain the weight losses, since these losses began while the animals were consuming sufficient nutrients to allow for appreciable gains.

Adding a phosphorus supplement to the deficient ration brought about an immediate response in appetite and a more economical utilization of nutrients as indicated by gains in weight. Aphosphorosis symptoms could be produced rather rapidly with cows of good producing ability, but a shortage of phosphorus in the ration was not as much a limiting factor in milk production as it was in body maintenance. A low phosphorus ration had a marked effect in inhibiting oestrum. Preliminary experiments with rabbits showed that it was not possible to produce the same symptoms of aphosphorosis as were observed in dairy cattle.

Rate of passage of inert materials through the digestive tract of the bovine, L. A. Moore and O. B. Winter (*Jour. Dairy Sci., 17 (1934), No. 4, pp. 297–305, figs. 3*).—In order to determine the rate of passage of inert materials through the digestive tract, the Michigan Experiment Station fed iron oxide and rubber disks to 3 and 6 cows, respectively.

Iron oxide first appeared in the feces in from 9 hrs. 55 min. to 13 hr. 20 min., and the rubber rings in from 10 hr. 45 min. to 19 hr. 30 min. The maximum excretion of iron oxide was reached at 33 hr. 10 min., and of rubber rings at from 23 hr. 12 min. to 60 hr. 30 min. The lag varied from 114 hr. 35 min. to 156 hr. 5 min. for iron oxide and from 141 hr. 52 min. to approximately 215 hr. for rubber rings. The animals which under comparable conditions first excreted the test material and first reached the maximum excretion had the fastest rate of excretion. An analysis of the data indicated that the feeding of a test material and the collection and examination of the feces for 60 hr. gave a comparable method for investigating the rate of passage of inert material.

The value of hand stripping after machine milking, J. L. Wilson and C. Y. Cannon (*Jour. Dairy Sci., 17 (1934), No. 4, pp. 331–338, fig. 1*).—At the Iowa Experiment Station the problem of hand stripping was studied from the following angles: (1) Amount of time spent in stripping and the amount of milk and fat secured in the strippings following machine milking, (2) the effect of omitting hand stripping upon milk production, and (3) the extent to which the amount of strippings can be decreased by methods designed to increase the thoroughness of machine milking.

After machine milking, stripping required on the average 1.6 min. per cow daily. On the average 1.2 lb. of milk and 0.1 lb. of fat, representing 4.2 and 7.3 percent, respectively, of the day's total production were obtained by stripping. When stripping was practiced the production of milk and fat was 2.5 percent higher than during periods when stripping was omitted. Not stripping resulted in a calculated loss of 54 percent of the milk and 27 percent of the

fat that would have been obtained in the strippings. Not stripping did not reduce the percentage of fat in the milk. Stripping returned 1.3 lb. of fat for each hour's labor.

The amount of strippings was decreased 33 percent by massaging the udder for 2 min. while the milking machine was operated. Pulling down the teat cups for 1 min. during the milking process reduced the amount of strippings 55 percent. This manipulation of the teat cups resulted in cows being more thoroughly milked in 5 min. than occurred in 6 min. of normal machine milking.

Does hydrated lime or 20 percent superphosphate kill any bacteria when used in the dairy barn? C. S. Bryan and F. A. Andrews (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 230–236*).—In work conducted in the laboratory with pure cultures and in the barn under natural conditions with the varied microflora found, details of which are presented in tabular form, it has been determined that "lime and superphosphate when applied to the walks and platforms in the dairy barn kill a large number of bacteria and are, therefore, very valuable for this purpose. The different bacteria in pure culture exhibit varying degrees of susceptibility to the killing action of lime or superphosphate." In tests conducted in which *Brucella suis* was selected as the test organism because of its close relationship to *B. abortus* and also because it is less susceptible to the physical environment, extremely small amounts of lime were needed to kill the organism. Superphosphate exerted much less killing power than the lime. *B. suis* was found more susceptible than the streptococcus to lime. The activity of both lime and superphosphate was reduced by the presence of liquid manure.

Factors influencing the initial induction period in the oxidation of milk fat, J. L. Henderson and C. L. Roadhouse (*Jour. Dairy Sci., 17 (1934), No. 4, pp. 321–330, figs. 7*).—The California Experiment Station undertook a study to measure the influence of sunlight, certain metals, and submaintenance rations of the cow on the initial induction period in the oxidation of milk fat. In preparing fat samples for testing, the cream and milk from which it was separated were protected from light, high temperature, and metals corroded by milk in order that the induction period for control samples would represent the true susceptibility of the fat to oxidation.

With the method used it was possible to measure the susceptibility of milk fat to oxidation due to exposure to direct sunlight, diffused light, or the action of copper. This exposure brought about definite increases in the susceptibility of the fat, and the extent of oxidation depended upon the exposure. Apparently direct sunlight had the greatest effect, nickel had a slight effect, and a chrome-nickel-iron alloy of the 18–8 series had no influence on the susceptibility of fat to oxidation. When the animals on a submaintenance ration drew upon their body fat for milk production, there was an increase in the percentages of unsaturated fats and an increased susceptibility of the fat to oxidation.

Influence of mastitis on the curd tension of milk, H. C. Hansen, D. R. Theophilus, F. W. Atkeson, and E. M. Gildow (*Jour. Dairy Sci., 17 (1934), No. 3, pp. 257–264*).—To determine whether there was any relationship between mastitis and the production of soft-curd milk by individual cows, the Idaho Experiment Station examined the milk of the cows in the university herd. A composite sample was taken from each cow's milk and, after discarding the foremilk, the following tests were made—bacterial count by the plate method; bacterial count by the plate method, using nutrient agar to which was added 1 percent of dextrose and 5 percent of defibrated horse blood; leucocyte count; curd tension; and streptococci or staphylococci grouping.

It was shown that mastitis caused by a streptococci infection always lowered curd tension. There was apparently no influence on curd tension when mastitis

was caused by a staphylococci infection. The black-cloth test was used successfully to detect mastitis due to a streptococci but not to detect that due to a staphylococci infection. In this study there was no correlation between the development of fibrous tissue in the udder and curd tension.

Laboratory methods for the detection of milk from cows infected with mastitis, W. V. Halversen, V. A. Cherrington, and H. C. Hansen (*Jour. Dairy Sci., 17 (1934), No. 4, pp. 281–296*).—An investigation to determine the merit of available methods for detecting milk from infected udders was undertaken at the Idaho Experiment Station. Middle milk from cows in the university herd was used, due to the wide variation in the numbers of bacteria in the foremilk and strippings.

Acute mastitis was usually readily recognized, but the most common form—chronic or subclinical mastitis—was often so mild that it passed without recognition. This type was best detected by examining milk from individual quarters. On plain agar the bacterial count for this type of mastitis often appeared normal, but on dextrose blood agar abnormally high counts were obtained. The leucocyte count of such milk was in excess of 100,000 per cubic centimeter; the catalase test usually produced 2.5 cc or more of gas; the pH concentration was only slightly reduced; the chlorine content was commonly normal; and the curd tension was usually reduced. Chemical tests commonly used for the detection of pus in urine were negative when applied to milk from known sources. By physical examination of the udder it was possible to locate tissue change due to disease, but chemical and bacteriological tests alone could actually establish the quality of the milk. Of 54 samples of retail milk examined, 33 contained enough catalase to produce 2.5 cc or more of gas and 34 contained more than 100,000 leucocytes per cubic centimeter.

On the basis of the data obtained it was felt that it was safe to conclude that leucocytes in excess of 100,000 per cubic centimenter and catalase in amounts that will produce 2.5 cc or more oxygen were reliable indexes of udder infection. Of the laboratory methods used for detecting subclinical mastitis, the leucocyte and catalase contents were the most reliable indicators.

Studies on whipping cream, II, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 17 (1934), No. 4, pp. 307–319, figs. 4*).—Continuing this investigation (E.S.R., 71, p. 377) at the Wisconsin Experiment Station, further data are reported for the effect of reactions. In addition, data are given on the following factors: (1) Temperature of cream separation, (2) cream pasteurization—temperature and cooling, and (3) homogenization—temperatures and pressures.

The reaction of the normal sweet cream appeared to be the most satisfactory for producing a good whipping cream. It was better to pasteurize cream immediately that had developed a slight acidity than it was to neutralize and then pasteurize. Adding less than 0.03 percent of acid did not have any appreciable effect on cream. When the titratable acidity calculated as lactic acid was above 0.27 percent the cream whipped rapidly but had a sour taste, and the whipped product had a low overrun and a soggy appearance. As the acidity of cream increased, the fat losses decreased.

Cream separated at 60° to 72° F. (15.5° to 22.2° C.) and at 150° F. whipped better than cream separated at intermediate temperatures. The amount of serum lost and its fat content was more satisfactory at the lower separating temperatures. The usual pasteurizing temperatures were satisfactory as far as whipping quality was concerned.

Whipping cream should be thoroughly cooled before bottling and storing for aging. Poorly cooled cream whipped more rapidly if stored for more than 70 hr. at 44° F. Cream intended for whipping should be stored for 24 hr., but if a shorter aging period is necessary the storage temperature should be held

close to 0° C. Homogenization had no beneficial effect and, if done, should be carried out at low temperatures and at a pressure not exceeding 100 lb. Adding sodium citrate to cream before pasteurizing decreased the whipping time, and the same effect was noted when sodium citrate was added immediately after homogenization. With increases in homogenizing pressures there was a marked increase in fat losses through drainage.

Judging dairy products, J. A. NELSON and G. M. TROUT (*Milwaukee, Wis.: Olsen Pub. Co., 1934, pp. 145, figs. 22*).—This treatise contains definite information on the fundamentals of judging market milk, butter, cheese, and ice cream.

VETERINARY MEDICINE

The osteodystrophic diseases of domesticated animals, A. THEILER (*Vet. Jour., 90 (1934), Nos. 4, pp. 143–175, [pls. 9]; 5, pp. 183–206, [pls. 3]*).—Part 1 of this contribution deals with the structure of the bone, atrophy, osteoporosis, and osteomyelitis (pp. 143–158); part 2 with rickets and osteomalacia (pp. 159–175); and part 3 with the osteodystrophia fibrosa (pp. 183–202). The contribution is presented in connection with a list of 139 references to the literature.

Worm parasites of domesticated animals in Queensland, F. H. S. ROBERTS (*Queensland Agr. Jour., 41 (1934), No. 3, pp. 245–252*).—Following annotated lists of the nematodes, trematodes, and cestodes infesting domesticated animals in Queensland, a host list with parasites recorded and a list of 21 references to the literature are presented.

The neoarsphenamin treatment of intestinal protozoal diseases in man, with special reference to amebic dysentery, W. L. CHANDLER (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, p. 296*).—The author's studies indicate that "a series of three intravenous injections of maximum doses (0.9 g) of neoarsphenamin given at 5-day intervals is successful as a treatment for intestinal protozoal infections, especially in amebic dysentery. The neoarsphenamin should be a recently manufactured product, administered as soon as dissolved, and the entire dose placed directly into the blood without loss of any of it in other tissues. Cases which have been checked upon periodically for more than 10 yr. failed to show the return of the dysenteric organism."

Transmission of anaplasmosis by various species of ticks, C. W. REES (*U.S. Dept. Agr., Tech. Bul. 418 (1934), pp. 18, figs. 2*).—In this contribution, presented in connection with a list of 22 references to the literature cited, a summary of the present knowledge of the subject, including the author's recent work, is presented.

It is pointed out that the following contributions have been made by the author to the technic of rearing ticks: "(1) Chicks from 2 to 10 weeks of age may be used for the engorgement of larvae and of nymphs of various ticks; (2) adhesive plaster is superior to draw strings for fastening bags to the ears of rabbits, dogs, or cattle, and to the scrotum of bulls; (3) cylinders made of fine-mesh wire screen and fitted over the ears of rabbits serve to prevent them from scratching off the cloth bags in which ticks are confined; and (4) garments with elastic bands, designed to fit the bodies of cows and steers, are effective for the collection of engorged larvae and nymphs."

Of 11 species of ticks belonging to 5 genera which have been incriminated throughout the world as vectors, the author's contribution includes 1 additional genus, *Dermacentor*, and 4 additional species, namely, the brown dog tick, *D. andersoni*, American dog tick, and *Ixodes scapularis*.

Sixteen cases of nonhereditary transmission and 1 case of hereditary transmission of anaplasmosis are said to have occurred at the laboratory at Jeaner-

ette, La. "In the former type of transmission, incubation period was 60 days in 1 case, and varied from 30 to 36 days in the other 15 cases. In the case of hereditary transmission the incubation period was 63 days. All tests of hereditary transmission were negative, except in 1 case in which anaplasmosis was transmitted by *Boophilus annulatus*. In six tests under conditions that appeared to be ideal—the larvae, nymphs, and adult ticks engorging on clinical cases—hereditary transmission by *B. annulatus* as a vector could not be obtained, but in 1 case the disease was transmitted by seed ticks which were developed from a female engorged under field conditions on a cow that was presumably a carrier of anaplasmosis."

The chemistry of the cellular constituents of the genus Brucella, R. C. Huston, I. F. Huddleson, and A. D. Hershey (*Jour. Bact.*, *27* (*1934*), *No. 1*, *p. 108*).—The genus *Brucella* has been found by the authors to be characterized as a group "by the absence of free simple sugars, by the occurrence of nonprecipitating polysaccharides only, by a large proportion of water extractable proteins, and by cell lipids analogous to the conventional types found in higher organisms.

"The species of the genus *Brucella* could be differentiated one from another by the relative proportions, rather than kind, of two biologically inactive polysaccharides and two lipid constituents. *B. melitensis* was distinguished further from the other two species by the occurrence of a nonprotein, nonpolysaccharide, precipitating antigen of a type hitherto undescribed."

Insect transmission experiments with herpes-encephalitis virus, J. S. Simmons, R. A. Kelser, and V. H. Cornell (*Science*, *79* (*1934*), *No. 2059*, *pp. 540*, *541*).—The authors report that while experimental transmission work with herpes-encephalitis virus by mosquitoes has been continued (E.S.R., 70, p. 390), they have been unable to obtain more definite evidence of the transmission of such viruses or to add anything that would confirm the conclusion drawn from the earlier experiments.

A virus obtained from influenza patients, W. Smith, C. H. Andrewes, and P. P. Laidlaw (*Lancet* [*London*], *1933*, *II*, *No. 2*, *pp. 66–68*, *figs. 2*).—The authors here report upon a disease of ferrets produced by the intranasal instillation of filtrates of human throat-washings obtained from influenza patients. The disease was found to be transmissible serially in ferrets either by contact or by the intranasal instillation of virus-containing material.

"The infective agent has, so far, only been recovered from the nasal passages of sick ferrets. The disease was produced by five of the eight throat washings obtained from influenza patients in the early stages of the disease. Throat washings from healthy persons and influenza convalescents caused no illness in ferrets. The nasal secretions from a subject with a severe common cold caused no illness in ferrets. Human sera, particularly those from influenza convalescents, were found to contain antibodies capable of neutralizing the virus of the ferret disease. Swine influenza virus caused a disease in ferrets which was indistinguishable from that produced by virus of human origin, and the pig and human viruses have close antigenic relationships."

When inoculated intranasally into ferrets the virus of swine influenza obtained from Shope (E.S.R., 71, p. 250) gave rise to a disease with diphasic temperature response and all the symptoms here described; in fact a disease indistinguishable from the ferret disease caused by virus of human origin. "The swine influenza virus was also readily transmissible serially through ferrets. In striking contrast to swine influenza the ferret disease was not modified in character when cultures of *Haemophilus influenzae* (*suis*) were inoculated together with the virus.

"Cross immunity tests have shown that this swine influenza virus bears a close antigenic relationship to the virus strain of human origin which has been chiefly used in our work. Ferrets after recovery from disease caused by the swine virus proved to be solidly immune to the human strain of virus. Ferrets convalescent from the human virus disease were not completely immune to the pig strain of virus."

The infection of ferrets with swine influenza virus, R. E. SHOPE (*Jour. Expt. Med., 60 (1934), No. 1, pp. 49–61, pl. 1*).—The experiments here reported confirm the observations of Smith, Andrewes, and Laidlaw, above noted, that the swine influenza virus is pathogenic for ferrets when administered intranasally.

"A disease that is clinically more severe and pathologically more extensive than that described by the above workers is obtained if inoculation with the virus is performed under ether anesthesia. Animals infected in this way show at autopsy an edematous type of pneumonia of lobar distribution which may terminate fatally. The virus maintains its pathogenicity for ferrets when stored in 50 percent glycerol at refrigerator temperature for as long as 75 days. After serial passage through 16 ferrets the virus is still capable of inducing swine influenza when mixed with *H[emophilus] influenzae suis* and administered intranasally to swine. Ferret passage causes no apparent attenuation of the virus for swine. Serum from pigs recovered from swine influenza is capable of neutralizing the ferret-passaged virus from either swine or ferrets. Likewise serum from recovered ferrets neutralizes the swine influenza virus for either ferrets or swine."

A change in the contagious character of a strain of swine influenza, R. E. SHOPE (*Jour. Bact., 27 (1934), No. 1, pp. 82, 83*).—The author reports that one strain of *Hemophilus influenzae suis*, under study for 3 yr., was observed to change from a condition of full contagiousness to one in which the disease, induced by contact, was of an extremely mild character. "The clinical and pathological picture presented by swine suffering from the mild illness acquired by contact is characteristic of the disease induced in swine by intranasal infection with the swine influenza virus alone (previously designated as 'filtrate disease'). Furthermore the mild contact-disease is of itself contagious, and it confers a solid immunity to swine influenza. Bacteriological examination reveals that the respiratory tracts of animals infected by contact are free of *H. influenzae suis*. The conclusion reached is that the change in the strain of swine influenza under discussion is one in which the virus alone transfers from sick to normal animals by contact. . . .

"During the course of the investigation it was observed that swine artificially converted into carriers of *H. influenzae suis* acquired swine influenza instead of the mild filtrate disease following exposure to animals infected with the old stock strain of swine influenza."

The bacteriology of chronic mastitis, G. J. HUCKER and P. A. HANSEN (*Jour. Bact., 27 (1934), No. 1, p. 73*).—In the course of investigations of udder infections at the New York State Experiment Station during the preceding 5 yr., over 125 autopsies were performed and the results correlated with laboratory examination of the milk secured prior to post mortem. The results indicate the prevalence of chronic or subclinical mastitis, as well as the significance of the laboratory examination of milk in the detection of abnormal udders.

Latent psittacosis and Salmonella psittacosis infection in South American parrotlets and conures, K. F. MEYER and B. EDDIE (*Science, 79 (1934), No. 2059, pp. 546–548*).—The authors' observations here reported are considered to have conclusively demonstrated the existence of psittacosis in tropical birds from Colombia, and consequently have justified the protective measures which

have been instituted against the importation of these pets into this country. Although the origin of the disease, whether contracted in nature or in the bird stores of Barranquilla, remains undetermined, it is considered reasonable in the light of other studies to assume that avian psittacosis is widely distributed among South American parrots, parrotlets, and paroquets.

Studies on pseudorabies (infectious bulbar paralysis, mad itch).—II, Routes of infection in the rabbit, with remarks on the relation of the virus to other viruses affecting the nervous system, E. W. HURST (*Jour. Expt. Med., 59 (1934), No. 6, pp. 729–749*).—In continuation of the earlier studies (E.S.R., 70, p. 677), it has been found that "after intramuscular, intradermal, and subcutaneous inoculation the pseudorabies virus reaches the central nervous system by way of the peripheral nerves, although it is circulating in the blood. Centrifugal spread from the infected nervous tissues by the neutral route also occurs. After intracerebral inoculation the virus passes in the reverse direction, down the nervous axis. The Aujeszky strain invades the blood stream more readily than does the Iowa strain, but possibly with repeated passage the latter is approximating in this respect more closely the classical Aujeszky strain. After intravenous inoculation, effective with even small doses, virus is rapidly removed from the blood, and multiple infective foci are established in various organs; thence ascent of the virus by the peripheral nerves leads to infection of the central nervous system, the symptomatology differing according to whether the spinal cord or the medulla is first reached. The lack of evidence that the virus can penetrate directly the hematoencephalic barrier deserves emphasis. Then subcutaneous inoculation is practiced in an area deprived of its nerve supply, the ability of the virus to invade the blood stream permits it to establish infective foci in the various viscera, and after a predictable delay the course of infection resembles that following intravenous injection.

"The pseudorabies virus is pantropic, i.e., it readily attacks cells derived from any embryonic layer. Lesions in the adrenal gland following intravenous inoculation are very like those due to herpes virus similarly introduced, this being one point of similarity in the pathogenic action of the two organisms. The relation of the pseudorabies virus to other viruses affecting the central nervous system is discussed."

A list is given of 28 references to the literature.

Relapsing fever in California, I–IV, G. E. COLEMAN (*Jour. Infect. Diseases, 53 (1933), No. 3, pp. 337–354; 54 (1934), Nos. 1, pp. 1–22; 3, pp. 281–304*).—Part 1 of the author's contribution deals with the experimental disease (pp. 337–354), part 2 with immunity (pp. 1–22), part 3 with the carrier condition—epidemiology (pp. 281–294), and part 4 with cross-immunity—susceptibility of Sierra golden mantle ground squirrels (pp. 295–304).

A study of Sierra golden mantle ground squirrels a month after capture failed to reveal the organism of relapsing fever, all attempts to infect them by several routes, singly or combined, having failed. Their blood serum, both before and after the injection of several strains, failed to protect mice not only against the strains injected into the squirrels but in some instances against other strains as well. It is thought probable that this species is immune to relapsing fever.

Preliminary note on the use of goat tissue vaccine alone for the control of outbreaks of rinderpest, P. J. KERR and M. B. MENON (*Indian Jour. Vet. Sci. and Anim. Husb., 4 (1934), No. 1, pp. 75–80*).—In the experiments reported, some 10,764 animals, while exposed to natural infection, were inoculated with goat tissue virus and outbreaks stopped. It is pointed out that one goat pro-

duces 2,000 to 2,500 doses as compared with some 500 doses of blood virus with small Bengal goats. The vaccine retains its potency in cold storage at 45° F. for 30 days after preparation and for 7 days at room temperature (maximum 85°) after removal from cold storage, under cold weather conditions.

A comparative study of Schistosoma spindalis Montgomery 1906 and Schistosoma nasalis n.sp., M. A. N. Rao (*Indian Jour. Vet. Sci. and Anim. Husb., 4 (1934), No. 1, pp. 1–28, pls. 5, figs. 5*).—This further contribution (E.S.R., 69, p. 858; 71, p. 246) deals particularly with two (*S. spindalis, S. nasalis*) of the five species of *Schistosoma* known to attack domesticated animals in India.

Contribution to the knowledge of the drug resistance of the surra trypanosome [trans. title], M. van Zwieten (*Tijdschr. Diergeneesk., 61 (1934), No. 7, pp. 350–356; Ger., Eng., Fr. abs., pp. 354–356*).—By the administration of small doses of drugs to mice in the laboratory the author succeeded in obtaining strains of surra resistant to Naganol-Arsacetin, Naganol-Atoxyl, and Naganol.

The type of tubercle bacillus infecting the monkey (Macacus rhesus), M. H. Brown (*Roy. Soc. Canada Trans., 3. ser., 26 (1932), Sect. V, pp. 295–297*).—In a study made of the invading micro-organism obtained from five monkeys, received, with others, from New York City wholesale dealers, the bovine type of *M[ycobacterium] tuberculosis* was found present. All five strains, when intravenously administered to rabbits, produced generalized fatal tuberculosis.

Undulant fever in New York State, R. Gilbert and M. B. Coleman (*Jour. Infect. Diseases, 54 (1934), No. 3, pp. 305–312*).—The authors conclude that if micro-organisms of the abortus-melitensis group can be divided into subspecies or types the findings indicate that only one, the bovine type, is prevalent in the relatively large area served. "Furthermore, the information available suggests that cattle or dairy products have been the source of the infection in most of the cases of undulant fever studied. A large percentage of the patients have had no contact with cattle, but have used raw milk or cream. A marked decrease in the incidence of undulant fever in New York State might be expected in the event of general, efficient pasteurization."

Toxic properties of greasewood, with a brief discussion of the physiological action of oxalic acid and its soluble salts, V. A. Willson (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 1, pp. 76–81*).—The author reports upon a study made of *Sarcobatus vermiculatus*, a shrub particularly adapted to strong alkali soils and old alkali seeps on which other vegetation is scarce. This shrub, which has been reported to grow in excess of 9 ft. high, although plants from 3 to 5 ft. high are more common, has been recorded from the Western States from Washington to Montana and from California to Texas.

The toxic effects of greasewood were found by the author to be due to the soluble oxalates of sodium and potassium. "The sodium and potassium salts were in the ratio of approximately 4:1. The oxalate content of greasewood leaves increases from the beginning of the growing season and reaches a maximum when the plant has matured during the late part of the summer. In all cases where greasewood leaves have been analyzed, the oxalate content is believed sufficient to produce oxalate poisoning if taken internally by sheep in appreciable quantities. Substances of this nature and containing a high percentage of soluble oxalates may be responsible for cases of chronic oxalate poisoning in the form of urinary calculi."

The diseases of dairy cattle, L. Jordan (*Jour. Dairy Res. [London], 5 (1934), No. 2, pp. 160–178*).—This contribution reviews the status of bovine tuberculosis (pp. 160–166), contagious abortion (pp. 166–172), and mastitis

(pp. 172–174), and is presented in connection with a list of 158 references to the literature.

Some studies on the hypophysis cerebri of cattle, P. H. Blickenstaff (*Vet. Alumni Quart.* [*Ohio State Univ.*], *21* (*1934*), *No. 4, pp. 132–148*).—In the material studied the author found that "there was a definite hypertrophy of the hypophysis in sterile cows. The average weight of hypophyses from open cows exceeded the average weight of those from pregnant cows or steers and bulls. The variation in weight of the hypophysis was far greater in open cows than in pregnant cows or steers and bulls. Papillary cystadenoma occurred with about equal frequency in both open and pregnant cows. There appeared to be a slight correlation of colloid degeneration and connective tissue proliferation in the hypophysis, with degeneration of the uterine epithelium."

Why cows fail to breed, C. F. Clark (*Michigan Sta. Quart. Bul.*, *16* (*1934*), *No. 4, pp. 247–253, figs. 2*).—A brief practical account, in which normal reproduction and the treatment and prevention of sterility are considered.

Prevention and eradication of Bang's disease, W. W. Dimock (*Kentucky Sta. Circ. 41* (*1934*), *pp. 12*).—This is a practical summary of information in which 4 methods of eradication are outlined.

***A dehydrated bacterial agglutination antigen* (Bang's disease),** C. R. Donham and C. P. Fitch (*Soc. Expt. Biol. and Med. Proc.*, *31* (*1934*), *No. 6, pp. 653–655*).—This is a preliminary report from the Minnesota Experiment Station on the use of a dehydrated bacterial antigen for agglutination testing. The studies reported deal with *Bacterium abortus* antigen used in the diagnosis of bovine infectious abortion.

Studies on a herd infected with Brucella abortus.—II, Incidence of milk infection in a vaccinated herd, D. W. Caldwell, N. J. Parker, and E. M. Medlar (*Jour. Bact.*, *27* (*1934*), *No. 1, pp. 72, 73*).—In this second contribution (E.S.R., 70, p. 679) the authors report that herd studies over a period of 3 years showed that 23.6 percent of the reactors were discharging *B. abortus* in their milk. The irregularity in the incidence of *B. abortus* in the milk of vaccinated cows led to an intensive study of the milk of reactors from which this organism had not been isolated. In this study in which 13 cows were employed, 288 daily, followed by 51 monthly, samples of milk gave negative results. In agglutination studies of the milk sera of 21 blood serum reactors from which 258 samples of milk were inoculated into guinea pigs negative results were obtained. Milk serum agglutination tests were negative for all but one cow from which *B. abortus* was repeatedly isolated from the milk of both right quarters, but was not found in samples from either left quarter.

Control and eradication of Brucella abortus infection in a dairy herd, J. H. Rietz and G. A. Bowling (*West Virginia Sta. Bul. 259* (*1934*), *pp. 12*).—The work of eradicating infectious abortion from the dairy herd of 80 head at the station by frequent testing and herd management commenced on May 1, 1930, at which time 22 reactors were detected, is reported upon, the details being presented at length in tabular form. The number of animals in the herd remained at practically the same level throughout the experiment, which continued to November 1933. During this period 163 different animals were tested one or more times.

"During the time covered by this experiment 7 additional reactors appeared in the herd. Three of these appeared the month following the beginning of the experiment. One animal gained access to the quarantined manure pit. The remaining 3 breaks cannot satisfactorily be accounted for. Twenty-two reactors were sold for slaughter, 6 became nonreactors and were in the herd

at the termination of the experiment, and 1 was reclassified as a suspect and sold for slaughter while so classified. One reactor only was retained in the quarantine longer than 6 weeks following parturition. This animal was retained 8 weeks on account of a vaginal discharge. All reactors had been eliminated from the herd by May 1933, and the herd was considered clean at that time. Replacements were made from heifers produced in the herd, excepting where purchase was made for new blood lines."

Brucella melitensis infection in cattle, R. A. BOAK and C. M. CARPENTER (*Jour. Bact., 27 (1934), No. 1, p. 73*).—It was found in a survey made for *B. abortus* infection in raw milk in three counties in central New York, as shown by guinea pig injection, that 20.4 percent of 122 samples contained the organism (E.S.R., 61, p. 872). Three of the cultures proved to be *B. melitensis* upon further serological and biochemical examinations and by monkey inoculation, and these cultures were isolated from samples of milk collected from herds in three rather widely separated towns in the area surveyed. Possible contact with goats was determined in two instances.

Observations on organisms associated with chronic bovine mastitis, W. N. PLASTRIDGE, E. R. SPAULDING, and G. D. BRIGHAM (*Jour. Bact., 27 (1934), No. 1, p. 74*).—In research work with bovine mastitis at the [Connecticut] Storrs Experiment Station periodic laboratory examinations were made on milk from individual quarters of 180 animals distributed in four commercial dairy herds. "Tests were made on two herds over a period of 5 yr. and on the other two herds over a period of 2 yr. For the purpose of securing information on the organisms responsible for chronic mastitis, repeated isolations of the predominating organisms occurring in the milk of animals with a definite history of mastitis have been made. The data obtained indicate that of 49 udders affected with chronic mastitis of from 1 mo. to 5 yr. duration, 35 were infected with streptococci and 14 with staphylococci.

"The streptococcus strains were divided into nine groups on the basis of ability to produce acid from mannose, mannite, raffinose, inulin, sorbitol, salicin, and trehalose. All strains fermented dextrose, galactose, lactose, levulose, maltose, and sucrose and failed to ferment arabinose, dulcite, and xylose. On repeated tests it was found that certain strains lost the ability to produce acid from trehalose and others gained this property. Results obtained with glycerine were generally unsatisfactory. Disregarding the reactions obtained with trehalose and glycerine, 77 percent of the streptococcus strains fell into a single group. The different groups could not be distinguished by any of the following tests: Colonies on blood agar, hemolysis in blood broth, hydrolysis of sodium hippurate, reduction of methylene blue milk, reaction in litmus milk, and final pH in dextrose broth.

"Forty-nine strains of staphylococci obtained from chronic cases of mastitis were divided into two groups on the basis of ability to form acid in salicin broth."

Papillomatosis in a bovine, H. MORRIS, J. A. BAKER, and J. A. MARTIN (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 1, pp. 105, 106, fig. 1*).—The authors report upon a case of papillomatosis observed in a 2-year-old Hereford bull received at the Louisiana Experiment Station.

Parasitic worms and their importance in sheep-farming, J. B. ORR, A. H. H. FRASER, and D. ROBERTSON (*Highland and Agr. Soc. Scot. Trans., 5. ser., 46 (1934), pp. 113–125, figs. 4*).—In this account of parasitic worms affecting sheep the authors report that the twisted wireworm (*Haemonchus contortus*) does not seem to be a serious pest in Scotland. Other worms, particularly the lesser stomach worm (*Ostertagia circumcincta*) and several small intestinal

worms, were found to be far more numerous, and in many cases the probable cause of disease. Two worms, *O. ostertagi* and *Cooperia oncophora*, were recorded for the first time in Scottish sheep.

The epidemiology of parasitic gastritis in sheep: Observations on the relative importance of the various factors concerned in the development of the disease, E. L. TAYLOR (*Jour. Agr. Sci. [England], 24 (1934), No. 2, pp. 192–208*).—The author finds that "there are two epidemiological types of parasitic gastritis, (1) where pathogenic infestation is acquired from a residue of infective larvae present on the land and (2) where pathogenic infestation is acquired as a result of autoinfestation. Infective larvae of *Ostertagia* can regain the surface of the soil after being turned in by the plow and retain their infectivity for 8 to 10 mo. in sufficient numbers to cause severe disease. *Nematodirus* larvae can regain the surface after being turned in by the plow and retain their infectivity en masse throughout the winter months.

"Severe hemonchosis can develop by autoinfestation alone, on clean arable land, in as short a time as 7 weeks. Severe ostertagiasis can develop from residual soil infestation alone in as short a time as 4 weeks. The residue of infective larvae where sheep have been penned over a field may be very different in different parts of the field. Lambs up to 7 weeks old are not susceptible to hemonchosis under natural farming conditions. Lambs as young as 9 or 10 weeks old may suffer from severe ostertagiasis under farming conditions. Conditions may be so favorable for larval development on arable land that even the relatively small number of eggs disseminated by ewes may be sufficient to leave a dangerous infection in the soil after once penning over. Six days is sufficient for the mass development of infective larvae under actual field conditions. Bare pastures are a danger, as conditions are then optimum for the acquisition of the larvae. Grazing where there is abundance of herbage (clover), to such an extent that the lambs cannot eat more than half of the crop (representing a minimum acquisition of infective larvae by grazing), does not safeguard against the development of ostertagiasis on arable land.

"There is an enormous difference between the suitabilities of various field conditions for larval development. The risk of pathogenic infection is much greater on arable land where precautions are not strictly observed than it is on permanent pasture. An extra supply of concentrated food is sufficient to ward off an outbreak of the disease where the rate of infestation only reaches a certain level, but where infestation is high a plentiful supply of concentrated food does not prevent the development of a severe outbreak."

The reaction of swine following experimental inoculation of a pathogenic strain of Brucella abortus of porcine origin, W. H. FELDMAN and C. OLSON, JR. (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 1, pp. 64–75*).—The observations here reported are considered to warrant the following conclusions:

"Although the particular strain of *B. abortus* utilized for inoculation of the swine has remained consistently pathogenic for guinea pigs, swine appear to possess considerable natural resistance following experimental exposure to this organism. The apparent predilection of the organism for the body of the vertebrae in spontaneous spondylitis is perhaps due to an accidental or causal deposition rather than to an inherent tendency of the organism for elective localization. Although the production of specific agglutinins followed exposure to the infective agent regardless of the method of inoculation, the gradual but definite diminution of the respective agglutinative titers suggests the probability of eventual recovery. The ability of a strain of *B. abortus* of porcine origin, which was pathogenic for guinea pigs, to induce serious illness and lesions in what might be considered a natural host was not demonstrated."

The account is presented in connection with a list of 14 references to the literature.

Equine encephalomyelitis cross-immunity in horses between western and eastern strains of virus, E. Records and L. R. Vawter (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 1, pp. 89–95*).—In continuation of their studies of equine encephalomyelitis at the Nevada Experiment Station (E.S.R., 69, p. 277; 70, p. 98; 71, p. 391), the authors have found 8 of 8 horses that were immune to western types of the virus to be immune or resistant to the eastern type of virus.

"Infection with the Delaware strain of eastern virus was readily induced in 3 nonimmune control horses, either by intracranial injection or intranasal instillation of a 1 percent virus suspension. Two of the controls became prostrate and were destroyed when moribund. The other control which received virus intranasally developed grave symptoms, followed by incomplete recovery. Ataxia still persists, indicating a probable permanent disability. The disease resulting from the administration of the eastern virus ran a more rapid course than that produced by the western type. Otherwise, there are no essential differences in the clinical syndrome produced by the two viruses. It appears from cross-immunity observations made on horses, the natural hosts for these viruses, that any difference between the eastern and western types of virus may be only one of virulence rather than specific immunologic dissimilarity."

Prevention of experimental equine encephalomyelitis in guinea pigs by means of virus adsorbed on aluminum hydroxide, H. R. Cox and P. K. Olitsky (*Science, 79 (1934), No. 2055, p. 459*).—In the experiments thus far conducted 40 guinea pigs have been inoculated with the aluminum hydroxide virus material—16 with the western strain of tissue culture virus, 10 with a mixture of eastern and western strains of similar material, 9 with the eastern strain of guinea pig brain virus, and 5 with a mixture of eastern and western strains of the brain virus. None of these animals was affected after the intracerebral injection of the homologous strains as a test for resistance. On the other hand, all the 14 control, nonimmunized guinea pigs died of experimental encephalomyelitis within from 72 to 96 hr. after the test inoculation.

Studies in surra.—I, The blood chemistry of equine trypanosomiasis (Trypanosoma evansi), R. Randall (*Philippine Jour. Sci., 53 (1934), No. 1, pp. 97–105*).—The author concludes that *T. evansi* causes death in equines, not by the production of a toxic substance liberated by the disintegration of the organisms nor by the exhaustion of the blood sugar and glycogen reserve, but by an asphyxia from an uncompensated acidosis, the mechanism of which is still undetermined.

A list is given of 14 references to the literature.

On the recovery of Aegyptianella pullorum Carpano from wild Argas persicus Oken, A. Komarov (*Roy. Soc. Trop. Med. and Hyg. Trans., 27 (1934), No. 5, pp. 525, 526*).—*A. pullorum* was found by the author in the blood of fowls bitten by fowl ticks received from a poultry farm near Tel-Aviv, Palestine, where fowls were apparently suffering from spirochetosis. Experiments conducted demonstrated that the presence of *A. pullorum* does not protect birds against subsequent infection with spirochetes, and that birds that have recovered from spirochetosis are susceptible to infection with *A. pullorum*.

Epidemic tremor, an encephalomyelitis affecting young chickens, E. E. Jones (*Jour. Expt. Med., 59 (1934), No. 6, pp. 781–798, pls. 2*).—This contribution relates to a hitherto unrecognized disease of young chickens that has appeared in New England flocks during the last 4 years, it having been referred to in a preliminary report by the author in 1932 (E.S.R., 69, p. 112). The disease, which has a characteristic and well-defined symptom complex, has

occurred in epidemic form in young chickens in Massachusetts, New Hampshire, Maine, and Connecticut.

"Tremor, principally of the head and neck, and progressive ataxia are the characteristic symptoms, either or both of which may be present in a single bird. Age at onset in field epidemics ranges from 3 days to 6 weeks, with a majority of cases reported at 3 weeks. Morbidity in commercial flocks ranges from 5 to 50 percent; mortality in affected hatches may be 50 percent. The disease may or may not recur in successive hatches and in the same flock in successive years. Although birds may survive an attack of the disease, nervous symptoms persist in a majority of cases.

"There is no evidence that nutritional factors are involved. Normal chickens have not contracted the disease by contact with affected birds. The disease has been reproduced in normal chickens by intracerebral inoculation of brain and spinal cord from affected birds. Twenty brain-to-brain passages have been made up to the present time. The incubation period in laboratory passages ranges from 6 to 44 days, with symptoms appearing usually between 21 and 28 days. The proportion of inoculated birds developing symptoms has increased with successive passages.

"The infective agent in the brain has survived in 50 percent glycerine for 69 days. No organism has been cultivated. The disease has been reproduced after inoculation with bacteriologically sterile filtrates obtained with Seitz and Berkefeld N filters. Attempts to demonstrate the presence of the infective agent in the chicken embryo have been inconclusive. Chicks hatched from eggs laid by birds which had survived the disease were not infected, nor were they immune to inoculation at 6 weeks of age.

"The characteristic lesion of the disease consists of microscopic focal collections of glia cells, perivascular infiltration, degeneration of Purkinje's cells, and degeneration of nerve cells. Foci of infiltration are present throughout the brain and spinal cord. In the viscera of birds from field epidemics, microscopic focal infiltrations of cells of the lymphoid series are often found. Their presence is most notable in the pancreas and heart. No cell inclusions have been demonstrated."

Cloacal infection as a means of immunization against infectious laryngotracheitis of fowls, F. R. Beaudette (*Jour. Bact., 27 (1934), No. 1, pp. 80, 81*).—This brief reference to studies at the New Jersey Experiment Stations relates to work conducted in connection with that previously noted (E.S.R., 70, p. 536). It is pointed out that when the virus collected from artificially infected birds and preserved by drying is used to produce a harmless infection of the cloacal mucosa, the local reaction disappears in about a week and immunity to respiratory infection is fully developed by the ninth day or earlier. "Immunity to artificial infection is known to persist for 9 months, and birds have been exposed for 21 months on infected premises without taking the disease. The loss incident to cloacal infection takes place within the first 3 weeks and is less than 2 percent. Survival of the virus in the cloacal has not been demonstrated. During the past summer cloacal inoculations were made on 23,800 birds under commercial conditions."

On filtrable viruses of leukosis and sarcoma of chickens, J. Furth (*Jour. Bact., 27 (1934), No. 1, pp. 79, 80*).—The author found avian sarcoma and avian leucosis to be caused by numerous filtrable agents characterized by the histological appearances of the alterations they produce. The data available are said to be insufficient to determine whether these agents are common living entities, as suggested by some investigators, or nonliving enzymelike substances, as supposed by others.

The etiology and histogenesis of leucosis and lymphomatosis of fowls, E. P. JOHNSON (*Virginia Sta. Tech. Bul. 56 (1934), pp. 32, pls. 8*).—After briefly reviewing the literature, the author reports upon investigations conducted at the station of the affection of the domestic fowl commonly known as fowl paralysis, which include transmission attempted with unfiltered tissue extracts, whole blood filtrates of blood, etc., by way of the alimentary tract, the respiratory tract, and intravenous and subcutaneous injections.

It was found that "bacteria-free and cell-free filtrates of the blood and other tissues of birds affected with any of the above forms of the disease may produce the same form as that of the donor, or they may produce any of the several expressions of the disease. Moreover, one form may change into another during the course of the disease, or two or more forms may exist in combination.

"The earliest stage of the disease is an hemocytoblastosis, characterized by the occurrence of hemocytoblasts in the peripheral blood and a proliferation of these cells in the marrow. In later stages the central nervous system, peripheral nerves, iris, as well as many of the visceral organs, may be infiltrated with these cells, as well as lymphocytes; this complex of conditions constitutes a lymphomatosis. At other times the lesions may resemble neoplasms consisting chiefly of hemocytoblasts, resulting in hemocytoblastomata. In other cases, at a later stage the differentiation may be to an erythroleucosis, or to the myeloid form.

"The radius and ulna marrow, which in normal adult fowls was found to be consistently hypoplastic, becomes hyperplastic in this disease. In the early stages of this condition the genesis of the predominant cells and their genetic relationship can be conveniently studied.

"In a study of erythrocytopoiesis in this marrow, one finds in the incipient stages of the disease increased mitotic activity of intravascular hemocytoblasts at the periphery, with gradually increasing mitotic activity of hemocytoblasts in the cortical stroma. In these regions small hemocytoblasts, generally resembling lpmphocytes, arise from reticulum cells, enlarge, and proliferate. In no instance did endothelial cells give rise to hemocytoblasts, red-cell ancestors, or the megaloblasts of Doan and others.

"From a study of normal chicken marrow injected with carmine gelatin, one is obliged to conclude that the vascular system in adult avian marrow is open. In many instances the venous sinusoids are continuous with the interlipoidal spaces, as evidenced by the injection mass completely encircling some of the fat cells."

Age, breed, and species susceptibility in transmissible leukosis, E. L. STUBBS (*Jour. Bact., 27 (1934), No. 1, p. 79*).—A description is here given of experiments conducted "with transmissible leucosis in day-old chicks, chicks up to 2 mo. of age, young chickens 4 mo. to 1 yr. of age, and old chickens 2 to 4 yr. of age. The shortest periods of incubation, with an average of 19 days, occurred in baby chicks. The highest incidence of successful transmissions occurred in baby chicks, with every chick becoming affected in some groups. The highest mortality was in the baby chicks. The younger the chicken, the shorter the period of incubation, the more numerous the takes, and the higher the mortality. . . . All ages became affected with transmissible leucosis." It is concluded that the virus of leucosis, which passes filters, apparently is different from the well-known virus diseases.

The etiology of fowl paralysis (neurolymphomatosis gallinarum-Pappenheimer), leucosis, and allied conditions in the domestic fowl.—Preliminary report, M. W. EMMEL (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 1, pp. 96, 97*).—In this preliminary contribution from the Florida Experiment Station, the author announces a series of papers now being prepared for

publication in which he expects to submit evidence to show that "(1) the same etiological agent is responsible for fowl paralysis, leucosis in its various forms, and other allied conditions in the fowl; (2) the primary etiological agent is nonspecific in that any one of a number of micro-organisms of the paratyphoid and typhoid groups of bacteria may serve as an inciting agent; (3) enteritis, most commonly caused by intestinal parasites, is a necessary predisposing factor; (4) cases of fowl paralysis, leucosis, and allied conditions so induced are comparable to naturally occurring cases."

The author contends that the inflammation of the intestines accompanying intestinal parasites provides an avenue of infection for the primary etiological agent. "The type of disease induced, i.e., fowl paralysis, erythroleucosis, myeloid leucosis, and allied conditions, depends upon (1) the resistance of the individual bird, (2) the severity and duration of the enteritis, (3) the inherent properties of the particular strain of paratyphoid or typhoid organism acting as the primary etiological agent, and (4) the number of organisms, rate of entrance, and the period over which such organisms gain access to the blood stream of the bird."

Experimental studies on the transmission of gapeworm (Syngamus trachea) by earthworms, P. A. CLAPHAM (*Roy. Soc. [London], Proc., Ser. B, 115 (1934), No. B 791, pp. 18–29, pl. 1, fig. 1*).—The author has found *Eisenia foetida*, an earthworm commonly found in contaminated soil in England, to be the important intermediate host of *S. trachea*, the common gapeworm of birds. "*Lumbricus terrestris* also acts as intermediate host but is less important. Using *E. foetida*, chickens have been infected with *S. trachea* originating from pheasants, partridges, rooks, and chickens. *S. merulae* also has been transmitted to chickens via *E. foetida*.

"The third-stage larva of *S. trachea* encysts in the muscles of the body wall of these earthworms and may remain dormant there until taken in by a chicken or other suitable host, when they hatch and may develop into gapeworms. No further development of the *Syngamus* larva occurs in the earthworm. They remain as third-stage larvae, but they have lost their sheaths. They are unlikely to be confused with any other nematodes which have been found in the earthworm except *Rhabditis pellio*. The larvae of *S. trachea* in the earthworm can be differentiated from those of *R. pellio* by the characteristic shaped buccal rods and the absence of any cuticular valved apparatus in the esophageal bulb."

Western duck sickness: A form of botulism, E. R. KALMBACH (*U.S. Dept. Agr., Tech. Bul. 411 (1934), pp. 82, pls. 6, fig. 1*).—This publication, presented in connection with a list of 73 references, reports upon the results of work conducted by the Bureau of Biological Survey, earlier references to which have been noted (E.S.R., 67, p. 322), and includes bacteriological contributions by M. F. Gunderson. Following the introduction and discussion of the scope of the present investigation, the author deals with the causative organism, *Clostridium botulinum*, type C; earlier theories as to the cause; other studies; history of the mortality; extent of distribution and mortality; species of birds affected; susceptibility of birds; other animals affected; human beings and type C botulism; symptomatology; pathology; demonstration of botulism as the cause of duck sickness; factors responsible for duck sickness or influencing its distribution; and remedial measures.

The range of the malady as an epizootic under natural conditions is restricted to the area of alkaline waters and soils of the Western States and the Prairie Provinces of Canada, which may be explained by the fact that alkaline media are highly favorable if not actually essential to potent toxin production,

High temperatures, stagnant pools or mud flats, and a prevalence of dead organic matter, as well as an abundance of birds feeding or obtaining their water from the infected areas, are factors making for pronounced outbreaks. The seasonal peak of the disease occurs in August, September, or October. The most effective remedial measures are those of prevention aimed to remove, by flooding or drying, the stagnant-water or mud-flat areas in which the disease has occurred. Added benefits have been derived from frightening birds from known infected areas and from rescuing afflicted individuals, which, through careful handling, may be given a better opportunity for recovery.

Spontaneous gout in turkeys, C. F. Schlotthauer and J. L. Bollman (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 1, pp. 98–103, figs. 3*).—The authors give a brief description of cases of spontaneous gout observed in five flocks of turkeys in April and May 1933.

Attempts to demonstrate a specific toxin of Salmonella aertrycke (var. meleagridis), R. Cameron and L. F. Rettger (*Jour. Bact., 27 (1934), No. 1, pp. 86, 87*).—In a study in which the major effort was devoted to a search for a specific toxin of *S. aertrycke meleagridis*, the etiological agent of a paratyphoid epizootic of turkeys, *S. pullorum* and *Escherichia coli* also received some attention.

"Filtrates of 12-day-old broth cultures of *S. aertrycke* (var. *meleagridis*) were found to be nontoxic for chicks and turkeys, but highly toxic for mice and rabbits. The toxic substances were 'nonspecific' in nature, since similar effects could be produced with the broth culture filtrates of *E. coli*.

"The broth culture filtrates of *S. aertrycke* (var. *meleagridis*) and *E. coli* possessed similar properties. The toxins of both were heat-stable and were destroyed by free hydroxyl ions, but not by hydrogen ions. They were digested with pepsin and trypsin, and could be concentrated by precipitation with ammonium sulfate. The appearance of the 'nonspecific' soluble toxin in the medium occurred at a time when the active growth phase of the culture had long passed, and after considerable aqueous extraction or autolysis had taken place.

"Attempts to demonstrate a specific toxin in filtrates of the turkey organism and of *S. pullorum*, by controlling various environmental factors, resulted in repeated failure. The presence of 10 percent carbon dioxide in the gaseous environment of growing cultures controlled the H-ion concentration of the culture medium and stimulated cell growth. The increase in the number of cells resulted in an increase in the potency of the 'nonspecific' toxin.

"By continued grinding of the washed cells of *S. aertrycke*, *S. pullorum*, and *E. coli*, a water-soluble substance was obtained which readily killed turkeys and chicks. Alternate freezing and thawing failed to liberate demonstrable toxin (for fowl). A combination of freezing and thawing and grinding did not increase the potency of the filtrable toxic substance to any appreciable degree over what long grinding alone accomplished."

Studies on the etiology of spontaneous conjunctival folliculosis of rabbits.—I, Transmission and filtration experiments, P. K. Olitsky, J. T. Syverton, and J. R. Tyler (*Jour. Expt. Med., 60 (1934), No. 1, pp. 107–118, pls. 2*).—The evidence obtained by the authors suggests that spontaneous conjunctival folliculosis of rabbits is due to a micro-organism—one having a low grade pathogenic action.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Alabama Station], E. G. Diseker, M. L. Nichols, and H. Sexton (*Alabama Sta. Rpt. 1932, pp. 7–10*).—The progress results are briefly reported of experiments with machinery for

planting and harvesting oats, and of studies of weed control, methods of curing hay, hillside planting and cultivating equipment, and soil erosion.

The computation of acreage under production-control contracts, S. P. LYLE (*U.S. Dept. Agr., Agr. Adjust. Admin., Wheat Sect., 1934, pp. [2]+14, figs. 5*).—Practical instructions are given to aid in the rapid and accurate measurement of field areas.

Soil dynamics.—VI, Physical reactions of soils to moldboard surfaces, M. L. NICHOLS and I. F. REED (*Agr. Engin., 15 (1934), No. 6, pp. 187–190, figs. 7*).—This is the sixth contribution to the subject from the Alabama Experiment Station (E.S.R., 71, p. 253). Data are reported from experiments the purpose of which was to show the general nature of the reaction of soil to moldboard surfaces.

The physical reactions of soil in various conditions to plow surfaces are classified. The reaction of soil in normal or good plowing condition is described from field studies. The pulverization of the slice was found to be produced by two sets of shear planes. The primary planes were formed by the wedge action of the point of the plow and extended upward and forward from the shin at an angle of 45° to the direction of travel. The secondary planes were formed at right angles to the primary planes, thus the soil was sheared in two directions to produce pulverization. The slice was turned by the rotation of the blocks formed by the primary planes upward and forward. The blocks were lifted so that they stood on the portion which was the furrow wall and were then pushed over forward to lie against the preceding furrow. The so-called tension effect of the plow was found to be due to variations in directional acceleration. The relationship of these reactions to plow design is briefly indicated.

Soil crusts: Methods of study, their strength, and a method of overcoming their injury to cotton stand, A. CARNES (*Agr. Engin., 15 (1934), No. 5, pp. 167–169, 171, figs. 2*).—Studies conducted at the Alabama Experiment Station are reported. A group of soils varying in clay and sand content was used, and artificial crusts simulating those produced by natural rainfall were produced in the laboratory. An apparatus was developed to measure the breaking strength of the crusts that were produced. A section of crust was removed, measured, and supported on two knife edges a known distance apart, L. A weight was then let down gradually on the section of crust half way between the supports. The weight was suspended by the spring of a Jolly balance. When the section of crust broke, the amount of the take-up in the spring indicated the weight, P, required to break the crust. From these measurements and determinations the modulus of rupture was calculated. The standard modulus used is the value of R in the formula $R=\frac{3PL}{2bd^2}$, in which b is the width of the crust section and d is its thickness.

It was found that crusts very similar to those found in field soils could be produced in the laboratory by sprinkling soil with large drops of water. The crusts appeared to be produced by the infiltration of colloids and later cementation of soil particles.

The amount of crust formed on a given soil was found to vary with the amount of rain. It appears for the soils with the least hydrated colloids, such as Cecil, Sumpter, and Houston, that the relationship between rainfall and the force of breaking for each soil follows a general law whose form is $R=ae^{bx}$, when R is the modulus of rupture, a the intercept constant, b the slope constant, and x the amount of rain in inches. R is proportional to the surface in contact, which is a function of pore space. The formula states that

the rate at which the pore space fills up under the action of water is proportional to the pore spaces.

The rate of drying was found to affect the breaking strength of the crust. A slow rate of drying produces a crust slightly harder to break. The breaking strength of crust formed under a given condition was found to bear an inverse relationship, within the range studied, to the amount of moisture in the crust at the time of breaking. The chemical nature of the soil affects the breaking strength of crust. The modulus of rupture of the crust of soils studied is greater in cotton middles than on ridges. Preliminary tests indicate that the injury to cotton stands caused by crust formation can be solved by the proper preparation of the seed bed before and at the time of planting. Planting cotton on a compacted seed bed affords a firm footing for the young plant in breaking through the crust and results in a more efficient use of moisture present in the soil.

Water penetration in hardpan citrus soils, C. A. Taylor (*Agr. Engin.*, *15 (1934), No. 6, pp. 202, 203, figs. 4*).—Studies by the U.S.D.A. Bureau of Agricultural Engineering are briefly reported as conducted in an orchard in which the plow sole would not ordinarily be considered bad, but in which the efficiency of irrigation was low when considered as the percentage of water applied that appeared in the root zone.

With reference to the different absorption rates in the tree furrows as compared to the center furrows, it was found that water should be held in the center furrows three times as long as in the tree furrows. A still further improvement was secured by shortening the length of run for the tree furrows. Shortening the length of furrow was found the most effective in increasing the efficiency when the soil takes water readily, and less so when the absorption rate is low.

Run-off and erosion from plots of different lengths, F. L. Duley and F. G. Ackerman (*Jour. Agr. Res.* [*U.S.*], *48 (1934), No. 6, pp. 505–510, figs. 3*).—Studies conducted at the Kansas Experiment Station are reported which included two sets of experiments. In each, four plats 3 ft. wide and 10, 20, 40, and 100 ft. long were used. These were surrounded by strips of galvanized iron set in the ground to a depth of 6 in.

There was a 3-ft. alley between plats, and the middle of all plats was on a line at right angles to the direction of the length of the plats. By this arrangement the soil conditions in each plat should be representative of those prevailing over the whole of the small area employed in the experiments. The slope of the land was 4 percent in experiment 1 and 4.4 percent in experiment 2. The plats used in the first experiment were only about 25 ft. south of those used in the second.

The soil in which the tests were carried on is Derby silty clay loam. This soil has a fairly permeable surface soil and the subsoil is a silty clay to clay in the B horizon, but has not developed anything that even approaches a clay pan. The soil and subsoil could, therefore, be considered as having characteristics that would permit rather rapid absorption.

To simulate rainfall most of the water was applied with sprinkling cans, although in a few cases natural rainfall was used. There was a larger percentage of surface run-off from the short plats than from the long ones. This seemed to be true with both the heavy and light applications of water for the plat lengths under consideration.

The results for soil erosion were less consistent. When the rate of water application was light there was a tendency for the erosion from the short plats to run relatively high as compared with the others. When the rate of application was heavy, i.e., 1 in. in 15 min., erosion was greater on the long plats.

These results indicate that when rainfall is light short plats may possibly undergo the greater erosion, but when rains are heavy the reverse is true.

Electrical power in the companionship of industry and agriculture, W. R. Woolrich (*Agr. Engin., 15 (1934), No. 3, pp. 102–105, figs. 4*).—Data are presented and analyzed indicating the position of electrical power in the integration of industry and agriculture, with particular reference to the plans and activities of the U.S. Tennessee Valley Authority.

Diesel power and field operating costs (*Montana Sta. Bul. 289 (1934), pp. 16, figs. 5*).—The results of experiments are reported which were conducted during the season of 1933, the purpose of which was to throw light upon certain phases of the use of cheap fuels in agriculture. This report deals only with the general nature of the utilization of cheap fuel through Diesel motors, since the experiments so far have covered only a limited number of tests.

It is pointed out that while Diesel fuel is not yet available at local oil stations it can be obtained at nearly every refinery in Montana at a comparatively low price. It was found that the servicing of the Diesel tractor is somewhat different from that of a gasoline tractor, but it offers no particular difficulties as the instructions of the manufacturers are easily understood.

Fuel costs are decidedly lower for the Diesel tractor. The amount of fuel used in the experiments was slightly over half the amount used per unit of work by the same type of gasoline tractor. This, together with the difference in price, resulted in a decided saving in cost for field operations. A minor saving was apparent in the cost of lubricating oil.

The higher initial price of the Diesel tractor was found to partly offset the savings in fuel through higher depreciation and interest charges, if the same number of working hours is assumed for gasoline and the Diesel tractor.

High-speed vs. low-speed internal combustion engines, S. F. Evelyn (*Agr. Engin., 15 (1934), No. 4, pp. 126–128, fig. 1*).—A technical analysis of the subject is presented.

Fuels for spark-ignition and compression-ignition engines, J. B. Fisher (*Agr. Engin., 15 (1934), No. 4, pp. 133–136, figs. 5*).—The subject is briefly presented from the standpoint of the manufacturer of internal-combustion engines. It is emphasized that the main problems encountered with small compression-ignition injection engines are the difficulty of conserving the heat of compression and the susceptibility to variations in fuel.

Alcohol-gasoline blends as engine fuel, R. B. Gray (*Agr. Engin., 15 (1934), No. 3, pp. 106–109*).—In a contribution from the U.S.D.A. Bureau of Agricultural Engineering, a summary is given of research from various sources on the use of alcohol-gasoline blends in internal-combustion engines. Data are also included from observations made by the bureau on the performance of alcohol-gasoline mixtures, compared with straight gasoline, as fuels in tractors, trucks, and stationary engines. In general, it is concluded that the use of alcohol as an engine fuel in the United States should present no special mechanical difficulties. Such use would seem to be merely a matter of economy.

Report on truck field tests in Canlubang, Laguna, using A-alkohl motor fuel No. 1, B-dehydrated alcohol, and gasoline as fuels, A. L. Teodoro and J. P. Mamisao (*Philippine Agr., 22 (1934), No. 10, pp. 720–744, figs. 2*).—Field data from tests made on a sugar estate on the use of alcohol fuels in motor trucks are reported. The objects of the study were (1) to determine the average economy of such fuels as A-alkohl motor fuel No. 1, B-dehydrated alcohol, and gasoline under different conditions; (2) to measure engine wear and degree of carbon deposit in the combustion chamber; and (3) to study the behavior of the engines when different fuels are used. Six trucks of the same make and length of service were used. The constituents by volume of A-alkohl

motor fuel No. 1 are: Alcohol (about 95 percent by volume) 99 percent, gasoline 0.5, and aniline 0.5.

The field tests showed that, all other things being equal, the shorter the hauling distance the shorter is the average mileage per given volume of fuel. A considerable amount of fuel is used unnecessarily by frequent starting and stopping of the engine and by habitual running on first gear, second gear, and reverse. The fuel consumption on level ground and on good roads is less than on plowed fields and on rolling areas.

The use of different engines of the same make and nearly of the same age under nearly the same Canlubang conditions pointed to the conclusion that with the carburetors adjusted to give satisfactory operation on different fuels the consumption of gasoline was least, A-alkohl motor fuel No. 1 next, and B-dehydrated alcohol the greatest. These results were based upon the weighted averages of more than 1,000 tests. Considering the consumption with gasoline as 100 percent, A-alkohl motor fuel No. 1 had 102 to 103 percent and B-dehydrated alcohol 110 percent when up-draft carburetors were used. With down-draft carburetors the percentage for A-alkohl motor fuel No. 1 was from 150 to 178 percent, and for B-dehydrated alcohol from 145 to 160 percent.

The use of different fuels for the same engine indicated that, all other things being equal, gasoline was first in miles per gallon and A-alkohl motor fuel No. 1 last. With the mileage per unit volume of A-alkohl motor fuel No. 1 as a basic unit, the equivalent averaged amounts for dehydrated alcohol and for gasoline were, respectively, 1.078 and 1.909 with up-draft carburetor and 1.320 and 1.932 with down-draft carburetors. The averages were nearly 1.2 for dehydrated and 1.9 for gasoline.

Considering the average ring wear per 1,000 km of travel and using A-alkohl motor fuel No. 1 as a basic unit, the ratios for gasoline and for B-dehydrated alcohol were respectively 1.54 and 2.19 with up-draft carburetor and 0.40 and 0.49 with down-draft carburetor. Exceptionally high piston ring wear, as shown by the truck using alcohol with up-draft carburetor might be due to the fact that the engine was newer by about 500 km than the others tested.

The carbon deposit reduced to grams per 1,000 km was least in A-alkohl motor fuel No. 1 and largest in B-dehydrated alcohol. The cooling water temperature was never beyond the normal requirement during any of the tests. B-dehydrated alcohol indicated higher averages than either A-alkohl motor fuel No. 1 or gasoline.

Fair operation of the engines was maintained during all the tests. Gasoline fuel was a little better than any of the alcohol fuels in points of flexibility and load pick-up. There was hardly any difference between them in ease of starting. A-alkohl motor fuel No. 1 needed a longer time for warming up the engine than either gasoline or B-dehydrated alcohol. No objectionable odors were produced with alcohol fuels when the engines were operated under adverse conditions.

Pneumatic tired equipment for farm use, E. C. Sauve (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 278–281, figs. 2*).—Tests of the relation of soil moisture to drawbar pull showed that in the drying process the moisture test of samples of the soil did not change in relation to the advantages gained in drawbar pull. The drying-out process of the soil over a period of a single day made a difference of several hundred pounds in pulling ability of the tractor. In sandy loam soils no difficulty was experienced in getting adequate traction even when the soil was wet and without the use of chains on the tractor.

In the field work which followed throughout the spring and early summer, the tractor equipped with low pressure pneumatic tires performed very well with the exception of an occasional stall after a shower. Fuel and daily duty

tests were made with satisfactory results, although it was not possible to make comparisons with steel-wheeled equipment. A considerable amount of the work was accomplished with the tractor in high gear, whereas in former years intermediate or second gear speed was required to pull the same equipment.

Reports on the tractor used in general farm operations were highly satisfactory, particularly in the operation of plowing, fitting, rolling, and cultivating in muck soils, and in harvesting hay and corn crops.

Keep the tractor pulling its optimum load, A. J. SCHWANTES (*Agr. Engin., 15 (1934), No. 5, pp. 170, 171, fig. 1*).—In a contribution from the Minnesota Experiment Station, data are presented from investigations of tractor operation at less than optimum load compared with operation at optimum load. The data were obtained from operators of 300 tractors in various parts of Minnesota and represent averages of all farm operations.

It was found that the fuel consumption per unit of work increases as the power decreases. When the tractor is developing only one-half its rated horsepower the fuel consumption per unit of work is almost doubled. When the power output is decreased the length of time per unit of work increases. The time required per unit of work is inversely proportional to the power output of the tractor.

The garden tractor in Michigan, E. C. SAUVE (*Agr. Engin., 15 (1934), No. 3, pp. 97, 98*).—This is a brief contribution from the Michigan Experiment Station summarizing the results of a questionnaire sent to several hundred owners of garden tractors scattered throughout Michigan. The data seem to indicate that the argument as to the relative value of horses and tractors is not important in market-gardening operations in Michigan. Garden tractors are recognized as essentially cultivating tools which, in many instances, must operate in narrow row crops for which horses are unsuited.

The average area on which garden tractors were used, based on the reports of 104 users, was 18 acres; 75 percent of this number used their tractors on 10 acres or less. Out of 24 owners who had small garden tractors under 1.5 hp., only 3 did all of their power work with tractors, including plowing. Twenty out of 52 reporting on sizes from 2 to 5 hp., and 9 out of 15 reporting on sizes from 6 to 10 hp., performed all of the work with tractors.

Field requirements of garden tractors, A. A. STONE (*Agr. Engin., 15 (1934), No. 3, pp. 91–96, figs. 5*).—In a contribution from the New York State Institute of Applied Agriculture, information is summarized covering the results of field tests with garden tractors and of a survey of the activities of farmers using them. The requirements of garden tractors for truck farming are presented, indicating that the machine should be small and light enough to replace the hand wheel hoe, and strong and heavy enough to do the work of one horse in cultivating wide row crops. Apparently cultivating is the most important operation performed by garden tractors, and their success is dependent upon their ability to cultivate well.

It was also found that the general-purpose garden tractor must be capable of cultivating and also capable of plowing at a depth of from 6 to 8 in. at a rate of about 1.5 acres per day. It should possess two forward speeds and one reverse speed, and must possess lateral stability sufficient to prevent tipping, side slipping, and unequal driving, when plowing with one drivewheel in the open furrow. It should be possible to attach a 30-in. lawn mower and should be easy to change from one implement to another. The field tests of garden tractors showed that in general plowing with such equipment has not been successful, owing to inability to plow deep enough to get a straight furrow and to secure good coverage. The machines do not have power enough to handl

a plow of proper size, and many models do not have weight enough on the drive wheels to secure good traction. In some models the lugs are obsolete. It has also been found that the operator has only indirect control of the plow in most models. In general, the conclusion is drawn that present models of garden tractors are more difficult to operate and control in plowing than a farm tractor.

Soil heating design curves, N. D. HERRICK (*Agr. Engin., 15 (1934), No. 4, p. 136, fig. 1*).—Graphic data are presented for use in the design of soil-heating installations. They make it possible to determine the length of cable necessary and the spacing of the cable in the bed after the heat density per square foot has been decided upon.

Corn harvesting methods in Connecticut, W. H. MCPHETERS (*Agr. Engin., 15 (1934), No. 4, pp. 137–139, figs. 5*).—In a brief contribution from the [Connecticut] Storrs Experiment Station equipment used in corn harvesting is described and illustrated, including the corn sled and the low wagon.

Hay curing.—III, Relation of engineering principles and physiological factors, T. N. JONES and L. O. PALMER (*Agr. Engin., 15 (1934), No. 6, pp. 198–201, figs. 9*).—This is the third contribution to the subject from the Mississippi Experiment Station (E.S.R., 69, p. 732).

Experiments are reported which showed that the practice of windrowing alfalfa hay aids the continuation of the natural physiological process of transpiration, resulting in a greater moisture loss over a period of a day. Double windrowing two hours after cutting furnishes hay with a better color, larger percentage of leaves, and a lower moisture content at the end of the day. The data indicate that the leaves of alfalfa plants aid greatly in lowering the moisture content of the entire plant. Photomicrographs showed a reopening of the stomata following windrowing two hours after cutting.

It has also been found that the process of crushing large-stemmed hays, such as Johnson grass and soybeans, will permit a needed change in methods and time required in curing. In this connection an experimental machine for crushing was developed and used with marked results. Johnson grass that was cut and crushed by this machine at 10 a.m. was reduced to a moisture content of 25 percent at the end of a 7-hr. period, whereas the uncrushed hay contained 37 percent moisture at the end of the same period. It is concluded that by cutting and crushing the hay an hour or more earlier in the day the possibility of curing the Johnson grass in one day is almost a certainty.

The unloading characteristics of orchard sprayer pressure regulators, K. R. FROST (*Agr. Engin., 15 (1934), No. 6, pp. 191–193, 197, figs. 6*).—The results of experiments conducted at the California Experiment Station are presented in which pressure regulators were tested on two 3-cylinder spray pumps having capacities of 16 and 20 gal. per minute and a capability of developing pressures of 600 lb. per square inch. The pressure was varied from 200 to 600 lb. per square inch during the tests, this being the range ordinarily used for spraying purposes.

It was found that the factors affecting the unloading characteristics of the standard pressure regulator are (1) the spring constant, (2) the areas of the diaphragm or piston and the valve seat, (3) the valve stem clearance, and (4) the total length of the spring.

The velocity of the liquid through the by-pass valve is sufficient, in some cases, to cause a back pressure on the pump, thus preventing the regulator from unloading. The power unit can be unloaded to one-fifth of the power required to operate the spray line (1) if the regulator is in good mechanical repair, (2) if a spring is used that can be compressed a large amount. (3)

if the area of the diaphragm or piston is not more than five times the area of the by-pass valve seat, and (4) if the valve-stem clearance is set properly. The relief-valve type of regulator is a good pressure-control device, but increases the horsepower instead of unloading the power unit. The check valve in the standard type regulator must prevent the liquid from leaking in order to unload the power unit.

A combined feed grinding and mixing unit, H. BERESFORD and F. W. ATKINSON (*Agr. Engin., 15 (1934), No. 5, pp. 162, 163, 166, figs. 4*).—A combination feed grinding and mixing unit developed and designed at the Idaho Experiment Station is described and illustrated and test data reported. A motor-driven hammer mill is used for grinding, elevating, and mixing the feed. By adding an auxiliary hopper with agitator to the grinder, grain or feed can be elevated 23 ft. through the blower pipe to overhead bins without passing through the grinder. By alternately filling and discharging the bins the feed can be thoroughly mixed after three transfers. Barley and oats were ground together at the rate of 800 lb. per hour with an energy consumption of about 10 kw.-hr. per ton. With the ration used, 1,000 lb. of feed were mixed per hour by the bin method with an energy consumption of 4.5 kw.-hr. per ton.

Iron stakes as supports for coniferous seed bed frames, J. L. VAN CAMP (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 263–266, fig. 1*).—Iron stakes used for this purpose at the forest nursery of the station are described.

Pressures and loads of ear corn in cribs, J. R. MCCALMONT and W. ASHBY (*Agr. Engin., 15 (1934), No. 4, pp. 123–125, 128, figs. 5*).—Studies conducted by the U.S.D.A. Bureau of Agricultural Engineering on the pressures exerted by ear corn on corncrib floors, walls, and cross bracing are reported.

An experimental corncrib 16 ft. long, 24 ft. high, and with a movable side which could be set to give widths from 8 to 12 ft. was erected for this purpose. The floor of the crib was supported by 6-in. steel I-beams spaced 2 ft. on center. Arrangements were made to calculate the pressure on the crib walls and floors from the measured strains at selected points in the steel beams and truss rods. A Whittemore strain gage was used for this purpose, and all steel beams were prepared for strain readings at 2-ft. intervals along their length.

The data indicate that the outward and downward pressures on the walls and the loads on the cross bracing of corncribs are much larger than is commonly supposed. Failures may be due to lack of cross bracing to resist outward pressure or to improperly designed cross bracing that is broken by the weight of corn above. Graphic data are presented which are believed to provide a basis for safe design of cribs 8 ft. wide. These data may be used for designing cribs up to 12 ft. wide, with proper allowance for increase in loads due to greater width of crib. The factor of safety should be large enough to provide for variations in weight of corn and unusually rapid filling of the crib.

A comparison of electric and coal brooders in the production of winter broilers, J. M. MOORE and H. J. GALLAGHER (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 266–278, figs. 5*).—Tests are reported in which five houses were used. Houses 1 and 3 were sided with car siding, roofed with roof boards on rafters covered with 3-ply roofing, and floored with double floor with single thickness of building paper between rough bottom boards and finished top flooring. Houses 2 and 4 were sided with 0.5-in. insulation board between studs and car siding, roofed with 0.5-in. insulation between rafters and roof boards, covered with 3-ply roofing, and floored the same as houses 1 and 3. House 5 was all metal.

Two 56-in. electric brooders with a rated capacity of 350 chicks and three No. 11, 52-in. hard-coal burners were used. The electric brooders were equipped

with standard equipment—a 440-w heating element, thermostat for heat control, a thermometer for recording the temperature beneath the canopy, and a small light to attract the birds beneath the hover. Natural draft ventilation was used.

Though the adverse weather conditions under which the experiment was conducted were very severe, the birds in all of the five pens came through satisfactorily. The rate of feathering of the birds reared under electric hovers was not as rapid as those reared under coal-burning brooders. With the ventilation system used the extra cost of insulating brooder houses 2 and 4 was not justified from the standpoint of fuel consumption. During the severe weather conditions additional auxiliary heat would undoubtedly have helped correct the unfavorable conditions in the electric brooder houses, but from a practical standpoint it is considered questionable whether the additional expense would have been justified. The electric brooders were easier to operate than the coal-burning brooders. With feed at $2 per 100 lb., coal at $14 per ton, electricity at 3 ct. per kilowatt-hour, and shavings at $9 per ton, there was no profit in producing winter broilers at 26 ct. per pound.

Air conditioning of farm buildings, A. J. OFFNER (*Agr. Engin., 15 (1934), No. 5, pp. 159–161, figs. 3*).—This paper briefly describes the ventilating systems, with incidental air heating, as designed for a set of farm buildings recently erected and now in use.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Alabama Station, 1931–32] (*Alabama Sta. Rpt. 1932, pp. 6, 7*).—Some findings are given for (1) a study of farm organization on the heavy clay soils of the Black Belt of Alabama by C. M. Clark, regarding labor income, returns on investment to nonoperator owners, and the effect of acreage of cotton on labor income; and (2) for a study by B. F. Alvord of the year-to-year changes in the farm organization on 84 to 106 farms in Marshall and DeKalb Counties from 1927 to 1931, especially as a result of changes in the price of cotton.

[Investigations in agricultural economics at the Delaware Station, 1932–33] (*Delaware Sta. Bul. 188 (1934), pp. 9, 10, 12–14*).—Results of investigations, not previously noted, include a table by M. M. Daugherty showing the receipts in the general fund of Delaware from different sources and the disbursements for different purposes in 1924, 1928, and 1932; and the findings of R. O. Bausman as to adjustments in type of farming in the State from 1914 and 1924 to the period 1928–30; as to the effect of type of farming on income; of feeding mixed hay, silage, and alfalfa, and the amount of pasture on milk sales per cow; and of type of farming, acreage of pasture, the feeding of silage, and amounts of mixed hay, concentrated feed, and alfalfa feed on seasonal variations in the sale of milk.

[Investigations in agricultural economics at the Maryland Station, 1932–33] (*Maryland Sta. Rpt. 1933, pp. X, XI, XV–XVII, XVIII, XIX*).—Results of investigations are included as follows: (1) A brief statement of findings as to average size of herds, farm receipts, labor income, and factors responsible for the best incomes found in a study of management records for 184 dairy farms; (2) table showing by years 1921–32 and by months January–June 1933 the class I or basic price of 3.5 percent milk in 9 cities of the United States; (3) yields, value, and cost per acre of producing crops on the station farm at College Park; and (4) brief statements of receipts, expenses, labor income, and factors affecting income, as shown by studies of 99 poultry farms and of 147 flocks of turkeys.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 122–132*).—Included are (1) an article—Some Notes on Marketing Livestock by Truck—by G. F. Henning, which summarizes chiefly in tabular form additional information obtained in the study previously noted (E.S.R., 70, p. 856) regarding time of arrival by truck at the Cleveland market of cattle, calves, hogs, and sheep from different mileage zones in January and July 1932, the preference of farmers in Crawford, Logan, Preble, and New London Counties as to marketing channels for livestock, the percentage of livestock marketed through the different channels by the farmers in the different preference groups, and the attitude of farmers and truckers regarding livestock trucking, with a table showing the suggestions of 54 truckers for the betterment of such trucking; and (2) a table by J. I. Falconer, bringing the index numbers of production, prices, and income previously noted (E.S.R., 71, p. 406), down through February 1934.

Current Farm Economics, Oklahoma, (June 1934] (*Oklahoma Sta., Cur. Farm Econ., 7 (1934), No. 3, pp. 37–52, figs. 3*).—Included are statements regarding the general agricultural situation by E. L. McBride, the world wheat situation by R. A. Ballinger, beef cattle by P. Nelson, and the agricultural standing of fruits and vegetables by F. B. Cross, and the usual tables of indexes, prices, and purchasing power of agricultural products in the United States and Oklahoma. Other articles included are: Revised Estimates on Recent Changes in the Size of the Farm Population of Oklahoma, by O. D. Duncan; Quality of Cotton Produced in Oklahoma, 1933–34 Season, by C. C. McWhorter; and The Bankhead Bill, by McBride.

Receipts and expenditures of county and township governments, 1932, H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 71 (1934), pp. [43]*).—This is the second bulletin on the study previously noted (E.S.R., 70, p. 553).

General indicators of the condition of Arkansas banks, B. M. GILE and F. L. GARLOCK (*Arkansas Sta. Bul. 298 (1934), pp. 28, figs. 15*).—The main purpose of this bulletin, prepared in cooperation with the U.S.D.A. Bureau of Agricultural Economics, "is to show the items in the published reports of banks which should be studied by depositors and the relationships between various items which set apart conservatively managed institutions from overextended banks." It is based upon a study of the reports for the period 1921–30 of 15 banks that remained open through 1932 and 13 banks that closed during 1930–32. Charts and tables show the findings as regards the ratios of the following items to deposits for the two groups of banks: Capital funds; loans, other stocks and bonds, and real estate (minus capital funds); cash resources and net United States securities (minus borrowed money); loans and other stocks and bonds; loans; cash resources (minus borrowed money); borrowed money; cash resources and net United States securities; and cash resources. A study is also made of the quality of loans in the two groups of banks, using examiners' reports, reports rendered by members of the Federal Reserve System on the volume of brokers' loans, commercial paper, and loans eligible for rediscount at Federal reserve banks, and an analysis by the authors of a considerable part of the loans of 12 banks.

The study showed that of the ratios studied, that of loans, other stocks and bonds, and real estate (minus capital funds) to deposits was the best indicator and that of cash resources to deposits the poorest. The authors state that the ratio of cash resources plus net United States securities (minus borrowed money) to deposits ranks almost as high as that of loans, other stocks and bonds, and real estate (minus capital funds) to deposits and may be espe-

cially recommended since it is a combination of the items with which people are familiar.

"A ratio which is easily computed and which separates weak from strong banks with a high degree of reliability may be found by (1) adding the cash in vault, balances due from other banks, and United States securities, (2) subtracting from this total the bills payable, rediscounts, bonds borrowed, and national bank notes, and (3) dividing the remaining sum by the deposits. In a strong Arkansas bank the percentage figure which results from this division will seldom fall below 25 percent, and it will usually be higher than 30 percent."

Agricultural credit legislation of 1933, H. H. Preston and V. W. Bennett (*Jour. Polit. Econ., 42 (1934), No. 1, pp. 6–33*).—The origin and functions of the principal Federal agricultural-credit agencies in operation March 4, 1933, are summarized, and the administrative changes and legislation since that date are outlined and discussed.

Farm mortgage experience of life insurance companies lending in South Dakota, H. A. Steele (*South Dakota Sta. Circ. 16 (1934), pp. 15, figs. 3*).—This supplements Circular 7, previously noted (E.S.R., 69, p. 446). Tables, charts, and maps show for the year ended December 31, 1932, data as to farm mortgages and farm real estate owned by life insurance companies, the amounts of mortgages delinquent over three months as to principal, interest or taxes, and the number of tracts and acreage sold during the year.

Farm real-estate valuations in Illinois, C. L. Stewart (*Illinois Sta. Bul. 399 (1934), pp. 541–616, figs. 9*).—This is an analysis of the 1930 Federal Census data and supplementary information for previous and subsequent dates made in cooperation with the Bureau of Agricultural Economics, U.S.D.A.; Bureau of the Census, U.S. Department of Commerce; and the Illinois Crop Reporting Service.

The census valuations for the State for 1930 are compared with those of earlier census and noncensus figures. The significant trends of Illinois farm realty valuations 1930–33 and the extent to which farm realty valuations 1926–33 have corresponded with rental trends are discussed. The differences of valuation in 1930 in different districts of the State and the valuations in minor civil districts—townships and precincts—are analyzed. A table is included showing for each county and its minor civil divisions in 1930 the average number of farms, acres per farm, the total value of farm real estate and value of land only, buildings and dwellings per farm and the total value, and value of land only and of buildings per acre.

"From 1920 to 1930 the downward movement in valuations was more marked in Illinois than in the entire country. By 1930, valuations of land and buildings per acre in Illinois had returned to figures which, by comparison with those for the country as a whole, were more in keeping with the smaller state-to-national ratios that held in years centering about 1890 than with the larger ratios of 1900 and later. The further lowering of valuations between 1930 and 1933 proceeded at a more rapid rate in Illinois than in the country as a whole."

On more than 19,000 cash tenant Illinois farms realty valuations in 1930 were 23 times the annual gross rent. The average valuations of farm buildings in the 1,628 minor civil divisions in 1930 had a wide range. Buildings other than farmers' dwellings were valued at less than an average of $500 per farm in 8.5 percent of such divisions and farmers' dwellings at less than $500 in 1.3 percent of the divisions. In 4.9 percent of the divisions, buildings other than dwellings had an average valuation in excess of $4,000, and in 1.2 percent of the divisions farmers' dwellings were valued in excess of $4,000.

Land was valued at a higher figure than buildings in every minor civil division, notwithstanding the facts that the decline of land valuations has been the more drastic and that buildings have tended to constitute a larger part of the total realty valuations for farms of all types and sizes.

Semi-annual index of farm real estate values in Ohio, July 1 to December 31, 1933, H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 69 (1934), pp. [7], figs. 2*).—This is a continuation of the series previously noted (E.S.R. 70, p. 848.)

Recent developments in methods of real estate tax equalization in Wisconsin, J. R. BLOUGH (*Jour. Land and Pub. Util. Econ., 10 (1934), No. 2, pp. 137–149*).—The recent developments in the procedure used in Wisconsin to bring about real estate equalization are described and explained.

Types of farming in southeastern Montana, V. D. GILMAN (*Montana Sta. Bul. 287 (1934), pp. 61, figs. 9*).—As a basis for planning desirable types of farm organization for the future in the area, 92 percent of which is now covered by native grasses, this bulletin sets forth the results of a study of the best available land classification and weather data and the physical organization of typically successful farms and ranches in the area.

"Types of farming in this area were studied in 1926 and again in 1929. Farm organization and management information was obtained for the years 1926 to 1928, inclusive, on 100 dry-land ranches and farms widely scattered over the area. . . . The aim was to obtain facts regarding the types of successful farm and ranch organization in the area and to bring to light the typical problems of each. The method used was to examine individual farms rather than to make a statistical analysis of groups. Farms studied were those that had been successful to a greater or less degree, but unusual cases of success, due to outside causes, were, so far as possible, avoided."

The classification of the lands, the climate, and the yield possibilities for range grass, wheat, and corn are described and discussed. The organization, size, land control, problems, etc., of specialized range livestock ranches, range livestock-alfalfa seed ranches, special alfalfa seed farms; specialized wheat-summer fallow farms, specialized wheat-range livestock farms, specialized wheat-milk cow-hog farms, and miscellaneous types of farms are analyzed and discussed. A marked trend toward larger units both of ranch and farm was noted.

Potato costs in Michigan in 1933, P. F. AYLESWORTH (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 219–224, fig. 1*).—Cost records were kept by 59 growers producing table stock and 39 certified seed growers. A table shows for 1933, with comparable data for the three preceding years, the average growing and marketing costs, by items, and other data as to yields, man, horse, and tractor hours used, pounds of seed and fertilizer used, etc. The major factors influencing yields and costs are discussed with tables showing the average cost, by items, and other data with different yields. A table shows the cost when 0 and 1, 2 and 3, 4 and 5, and 6 and 7 of the following factors were above the average: (1) Planted before June 3 for the certified or June 10 for the table stock potatoes, (2) fall plowing, (3) man labor for growing the crop, (4) seed cost per acre, (5) total fertilizer, (6) number of sprays, and (7) closer than average spacing.

Michigan sugar beet costs in 1933, K. T. WRIGHT (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 215–219, fig. 1*).—Records of labor expenses, yields, etc., were obtained from 45 sugar beet growers. A table is included showing for the 45 farms, the 10 low-cost farms, and the 10 high-cost farms the average acreages per farm; the yields; the man, horse, and tractor hours in producing beets; pounds of seed and fertilizer used; production and market costs, by items;

credit for tops; net cost and cash cost per acre; and the net cash cost at farm and sugar plant per ton. The factors affecting yields, costs, and returns are discussed. A table shows the average cost for different groups of growers ranked on the basis of whether 1, 2, 3, or 4 or 5 of the following good practices were followed: (1) Planting on or before May 10, (2) rows not over 22 in. wide, (3) having good drainage, (4) land valued at $70 an acre or more, and (5) less than average charge ($8.02) for labor, power, and machinery.

Sugar, R. L. O'Brien et al. (*U.S. Tariff Comn. Rpt. 73, 2. ser. (1934), pp. XI+256, pl. 1, figs. 35*).—This is the report of the U.S. Tariff Commission to the President of the United States on the differences in costs of production of sugar in the United States and in the chief competing country, Cuba, as ascertained pursuant to the provisions of section 336 and for the purpose of section 332 of title III of the Tariff Act of 1930.

The findings of the Commission and summaries of the information obtained on raw sugar, refined sugar, costs of Puerto Rican and Philippine raw sugar, and the costs of sugar in the United States, the several insular areas, and Cuba are included.

A supplemental report on the relation of the duty and processing tax upon molasses and sirups to the duty and processing tax on sugar is also included.

Factors affecting costs of producing pork in southeast Alabama, J. D. Pope and H. T. Wingate (*Alabama Sta. Bul. 240 (1934), pp. 19, figs. 3*).—In cooperation with the U.S.D.A. Bureau of Agricultural Economics, a study was made on 99 farms in 1927–28 and 80 farms in 1928–29 of the costs per 100 lb. of pork and returns per acre of producing hogs with the general system used, which consisted of fattening on runner peanuts during the fall and winter months and maintaining the herd on permanent pasture and hand-fed feeds.

Of the costs, 23 percent consisted of home-grown feeds fed by hand, 5 percent of purchased feeds fed by hand, and 62 percent of peanuts grazed. The cost of producing pork ranged from $3 to $9 per 100 lb. on a majority of the farms. The 2-yr. average costs of producing 100 lb. of marketable pork and 100 lb. of total gain were $6.73 and $6.50, respectively; incomes per 100 lb. of gain were $7.06 and $6.82, respectively. The net return per acre of peanuts grazed averaged $5.70. Costs and returns were about equal on the farms which fattened the hogs in the fall and winter and those which began fattening in the latter half of the summer on early maturing finishing crops, particularly Spanish peanuts. High yields of finishing crops were associated with high poundage of pork produced per acre and low total costs. Amount of feed disappearing or used per 100 lb. of gain was an important factor affecting costs. Quantity of grazed feed disappearing per 100 lb. of gain was associated with number of hogs on hand September 1 and number of days of grazing provided for consuming a given quantity of feed. The farms above the average in yield per acre of crops hogged-off and adjustment of number of hogs to feed supply produced pork at a cost of approximately $5.50 per 100 lb. of marketable gain as compared with $8 for farms below the average in the two factors.

Adjusting hog production to market demands, M. Guin (*South Carolina Sta. Circ. 52 (1934), pp. 24, figs. 7*).—"The purpose of this circular is to describe and analyze the methods and price factors in marketing South Carolina hogs. It aims to bring out significant facts and point out specific problems relating to the marketing of South Carolina hogs."

The place and importance of hogs in South Carolina; various phases of hog management and marketing in Orangeburg County, a county representative of the Coastal Plain area; cycles and seasonal changes in hog prices; hog

prices in the Richmond and Baltimore markets; freight rates from different South Carolina points to Richmond, Va., Baltimore, Md., and Greenville, S.C.; shipments and slaughter of hogs in South Carolina; hog grades; and cooperative marketing of hogs in South Carolina are discussed.

A study of horses on farm account keeping farms in Michigan, A. M. Hauke (*Michigan Sta. Quart. Bul., 16 (1934), No. 4, pp. 224–230*).—Farm records from 194 horse-power and 233 horse-tractor farms in 1929 and 373 horse-power and 397 horse-tractor farms in 1932 are analyzed to show the changes in the number of horses on farms, number of horses purchased and sold and colts born, the age of horses, horses per cropped acre, etc.

Fluctuations in prices of cotton futures contracts, L. D. Howell (*U.S. Dept. Agr., Tech. Bul. 423 (1934), pp. 22, figs. 11*).—This is a study of the extent and distribution of actual daily and weekly fluctuations in cotton futures prices on the New York Cotton Exchange from August 1, 1917, to August 1, 1933. The daily ranges in prices of contracts above and below the lowest price of the closing range for the same month on the preceding business day were calculated. The ranges in price fluctuations during the day and during the week were also tabulated and are summarized in the tables and charts presented.

"The results of this study of fluctuations in prices of cotton futures contracts show that for contracts bought and sold prior to the month of their maturity the range in prices during the day equaled or exceeded 2 ct. per pound only 19 times, or about 0.4 percent of the time, during the 16-yr. period 1917–18 to 1932–33. Fluctuations in prices above and also below the closing price on the previous day each exceeded 2 ct. per pound only 6 times, or approximately 0.1 percent of the time.

"Changes in prices during the day were less, on the whole, for contracts bought and sold during the month of their maturity than for contracts of other months.

"The extent of price changes during the day varied directly with the level of prices of the contracts. The range of prices during the day and fluctuations in prices above and below the closing price on the previous day increased progressively from the lower to the higher price-level groups.

"Analyses of the data on the basis of graduated limits indicate that changes in the price level of cotton futures contracts were generally associated with corresponding proportional changes in prices during the day and during the week."

Summary of Ohio milk marketing agreements in 55 areas in Ohio, P. A. Young and R. W. Sherman (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 70 (1934), pp. 20*).—"This summary of milk marketing agreements as approved by the Ohio Milk Marketing Commission includes agreements approved to the date of April 30[, 1934]. The more important facts on prices are listed and grouped under two main divisions—the producers prices and the consumers prices. Any other important information, especially with reference to provisions in the buying plans, is included in comment form."

Financial operations of Ohio farmer owned elevators during the fiscal year 1932–33, B. A. Wallace (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 66 (1933), pp. [14]*).—This is a continuation of the series previously noted (E.S.R., 69, p. 456). The tables are based upon the main balance sheets and income and expense items of 146 companies; detailed analysis of expense items of 46 companies; commodity sales and margins of 45 companies; monthly figures of charges, collections, and balances of accounts receivable of 17 companies; and data from previous reports.

Local prices of farm crops in Minnesota, L. F. Garey (*Minnesota Sta. Bul. 303 (1934), pp. 32, figs. 18*).—This is a study of the variations in the prices of corn, barley, oats, wheat, rye, flax, and potatoes between different sections of the State and of the factors responsible for the variations. The average prices for the period 1925–30 are used. Maps show by counties for each crop for the periods 1925–30 and 1910–15 the average prices of the several crops. Tables show the changes in prices from the earlier to the later periods in the four different sections of the State. Other tables show for the period 1925–30 the effect on prices of such factors as percentage of crop shipped out of the county where produced, distance to Minneapolis, relation of acreage in the crop units of livestock, corn-hog ratio, relation of acres of oats to number of horses, percentage of protein in wheat, etc.

Crops and markets, [June 1934] (*U.S. Dept. Agr., Crops and Markets, 11 (1934), No. 6, pp. 177–216, figs. 3*).—Included are tables, reports, charts, summaries, etc., of the usual types, covering crop and livestock estimates, market reports, and the price situation of important agricultural crops.

FOODS—HUMAN NUTRITION

Cake and biscuit-making qualities of flours from Maryland wheats, W. B. Kemp, G. E. Eppley, and C. Welsh (*Maryland Sta. Bul. 360 (1934), pp. 331–344*).—In this investigation, in which the authors were assisted by M. Edmunds, I. Dynes, M. R. Temple, and E. Sargent, an attempt was made to throw light upon four problems: "(1) The cakemaking qualities of flour from Maryland wheat in comparison with those of commercial cake flours, (2) the effect upon cake quality of differences in protein content within the range of variability ordinarily presented by flour from the local crop, (3) the effect of patent milling and bleaching upon cakes made from these flours, and (4) biscuitmaking qualities of flour from local wheat in comparison with those of commercial general purpose flour."

Although the work covered preliminary studies in 1929–30 and regular tests during the 3 following years, only the 1932–33 tests are reported. For these, 3 samples of flour were used in the cakemaking tests, Leap and Forward from College Park and Forward from Carroll County and a fourth, Mammoth Red, from College Park for biscuitmaking. The Mammoth Red flour was milled straight and the others separated into straight flour, patent flour, straight flour bleached (chlorine), and patent flour bleached. One or more brands of commercial cake flour were used in the control cakes and a commercial general purpose flour for the control biscuits. Standard procedures were used throughout. In the cake flour tests, poundcake, gold cake, and angel-food cake were selected to cover the range of variability of cake characteristics.

Within the range of variability normally found in Maryland wheat, a low percentage of protein in the flour was associated with high volume, but no significant increase in score, of poundcakes. The other two types of cakes were not affected. Poundcakes made from the patent flour had significantly higher volume and score than those from the other flours, but no significant differences were observed in gold cake or angel food. The chlorine-bleached flour gave significantly higher scores for poundcake, although the increase in volume was not statistically significant. Neither volume nor score of gold cake was affected by bleaching the flour, but the volume of the angel food was markedly decreased. There were no significant differences in scores of biscuits made from any of the experimental or control flours.

The authors conclude that poundcake equaling in both volume and score that made with commercial cake flour may be made with patent flour from

local wheat if it is bleached with chlorine, that gold cake equaling that made with commercial cake flour in volume and score may be made with straight flour from local wheat without special treatment, that none of the test flours examined is equal to commercial cake flour for angel-food cake, and that biscuits equaling those made from commercial general purpose flour may be made with straight flour from local wheat.

Recipes especially adapted to the Maryland flours under test are given for butter cakes, doughnuts, muffins, griddlecakes, waffles, pop-overs, and pastry.

Some experiences with the wheat meal fermentation time test for evaluating soft wheats, O. B. Winter and A. G. Gustafson (*Cereal Chem., 11 (1934), No. 1, pp. 49–56, fig. 1; abs. in Michigan Sta. Quart. Bul., 16 (1934), No. 4, p. 296*).—The wheat meal fermentation time test was compared with three other tests—protein content of the flour, volume of loaf, and volume by expansion of dough, according to the technic described by Wilsie et al. (E.S.R., 67, p. 620), on five varieties of Michigan-grown wheat.

The highest positive correlations were found between volume of loaf and expansion of dough, next between fermentation time and volume of loaf, and finally between fermentation time and expansion of dough. The fermentation test showed proportionately greater differences between the various samples of flour than did any of the other tests.

A modification of the test is described in which the expansion of the dough ball is measured instead of the time of fermentation. The modification requires less time and compares favorably in results. A disadvantage is that it requires a larger amount of material.

Types of greens or pot-herbs used in rural Utah homes, A. P. Brown (*Utah Sta. Circ. 104 (1934), pp. 24, figs. 14*).—The results are reported briefly of a survey of the extent to which the housewives of Utah make use of wild and cultivated greens, the date at which each of the greens is first available, and the length of the season for each. The tabulated data from 175 questionnaires, representing 22 counties, show a total of 20 cultivated and 17 wild greens in common use. Illustrations, botanical descriptions, and methods of preparation for the table of 14 of the more commonly used wild greens are given as an aid to their more extensive use.

The chemical composition of some plants used by Australian aborigines as food, I. W. Dadswell (*Aust. Jour. Expt. Biol. and Med. Sci., 12 (1934), No. 1, pp. 13–18*).—Analyses, both proximate and mineral, of various plants used by the Australian aborigines as food are given, with comparative values for similar common cultivated foods, as reported in the literature. The principal differences noted were moisture, which was lower in the fresh native food than in similar cultivated foods, and crude fiber and total ash, both of which were higher in the native foods. Inasmuch as sand and silica constituted an appreciable amount of the total ash, the probability of contamination of the samples is suggested. However, in most cases calcium and magnesium were present in much higher concentration in the native plants and phosphorus in every case was low, ranging from one-tenth to one-half the amount in similar cultivated food plants. This resulted in markedly different ratios of calcium to phosphorus in the foods from the two series. Iron was more plentiful in the native foods even with due allowance for contamination.

Canning of apricot juice, A. Shallah and W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 13 (1934), No. 7, p. 205*).—A method which has been developed at the Fruit Products Laboratory, University of California, for utilizing small apricots in the manufacture of apricot pulp or juice is described, and possible uses and advantages of the product are discussed.

A preliminary report on the preparation of an infant food, a soybean milk-egg powder, E. Reid (*Chinese Jour. Physiol.*, 8 (1934), No. 1, pp. 53–64, figs. 4).—The preparation of a soybean milk-egg powder is described, and data are reported on a comparison of the product with cow's milk as to composition, curd formation in vivo (rats) and in vitro, buffer capacity, and peptic and tryptic digestion alone and combined in vitro.

The new soybean preparation formed softer, less compact curd than cow's milk and had a lower buffer capacity. It was less easily digested by pepsin and trypsin in vitro within the normal range of gastric acidity in infants, but as easily digested at low gastric acidity.

Need for uniform practices in the microbiological examination of food products, L. H. James (*Amer. Jour. Pub. Health*, 24 (1934), No. 4, pp. 325, 326).—This brief report from the Bureau of Chemistry and Soils, U.S.D.A., describes the steps which have been undertaken by a committee of the food and nutrition section of the American Public Health Association to organize work on the development of standard procedures for the microbial analysis of foods, and discusses the needs for such standards.

Need for methods for the bacteriological examination of Crustacea, A. C. Hunter (*Amer. Jour. Pub. Health*, 24 (1934), No. 3, pp. 199–202).—This contribution from the Food and Drug Administration, U.S.D.A., discusses the methods of production of crab meat products, with the possibility of contamination in the absence of strict sanitary control, and describes a method which has been developed for the bacteriological examination of such products. The importance is urged of the adoption of a uniform method of examination "acceptable to and used in common by all agencies having a part in the sanitary control of these products."

The control of mould fungi in dairy factories and meat-works, J. C. Neill (*New Zeal. Jour. Agr.*, 48 (1934), No. 2, pp. 70–75).—The Plant Research Station, New Zealand, undertook a study of the efficiency of the various methods used to eliminate mold infection on the woodwork and utensils of factories manufacturing foodstuffs. The laboratory tests showed that the chlorine disinfectants were ineffective for suppressing species of *Cladosporium* and *Penicillium* on wood. Copper sulfate and formaldehyde were effective, but the latter required a closed atmosphere for best efficiency. The most practical control was the use of hot water accompanied by rubbing. The roughness of the surface of the wood and the degree of infection of mold colonies markedly affected the degree of control.

Suggested laboratory proceedings for use in determining the cause of food poisoning, S. A. Koser (*Amer. Jour. Pub. Health*, 24 (1934), No. 3, pp. 203–208).—An outline is presented of the successive steps to be taken in attempting to determine the cause of food poisoning outbreaks. The laboratory procedures include first and subsequent bacteriological examinations of the suspected material, checking of suspected *Salmonella* or other intestinal types, and examination of the feces. The interpretation of results is discussed, and comments are given upon the general procedure. Several references to the literature are appended.

How science can help to improve the nation's food supply (*Jour. Soc. Chem. Indus., Chem. and Indus.*, 52 (1933), No. 31, pp. 624–645, figs. 7).—This symposium, held at a session of the food group of the Society of Chemical Industry (Great Britain) at its 1933 meeting, consists of papers by H. D. Kay on milk and dairy products (pp. 624–630), by E. A. Fisher on wheat (pp. 631–637), by J. Hammond on meat (pp. 637–640), and by H. J. Page on fertilizers (pp. 640–645.)

"Dumb housewives" (*Food Indus., 6 (1934), No. 6, pp. 256, 257, figs. 2*).—In this anonymous paper the author, evidently a homemaker, criticizes the food manufacturer for misleading and untruthful advertisements, untested and too complicated recipes, and poorly designed packages. "We want to know what is in your product, the quality of its ingredients, the truth about your claims for vitamins, enzymes, and other discoveries of the chemist and the doctor. Partially prepared, labor-saving foods are priceless to the overworked mothers of large families, to the business woman, to the physically delicate, and of course, are indispensable to the lazy woman. What a field for honest service by honest products."

The nutrition question, F. G. HOPKINS ET AL. (*Brit. Med. Jour., No. 3828 (1934), pp. 900, 901*).—This is the report of a conference held by representatives of the nutrition advisory committee of the Ministry of Health [Great Britain] and the nutrition committee of the British Medical Association to discuss the differences in recommendations of the two committees in regard to calorie and protein standards (E.S.R., 68, p. 125; 70, p. 718).

Concerning the caloric requirements, the conference agreed that 3,000 calories per day represents the average requirement of the entire population of large mixed groups, but that in the case of individuals and single families the following sliding scale should be used:

Sliding scale of calorie requirements per day

Individuals	Calories gross	Individuals	Calories gross
Man (heavy work)	3,400–4,000	Child (12 to 14)	2,800–3,000
Man (moderate work)	3,000–3,400	Child (10 to 12)	2,300–2,800
Man (light work)	2,600–3,000	Child (8 to 10)	2,000–2,300
Woman (active work)	2,800–3,000	Child (6 to 8)	1,700–2,000
Woman (housewife)	2,600–2,800	Child (3 to 6)	1,400–1,700
Boy (14 to 18)	3,000–3,400	Child (2 to 3)	1,100–1,400
Girl (14 to 18)	2,800–3,000	Child (1 to 2)	900–1,100

As to protein, the total need was estimated as between 80 and 100 g per man per day. For adults it is recommended that the proportion of animal protein be not less than one-third and preferably at least one-half of the total protein. The importance of milk for children and for nursing and expectant mothers was emphasized.

Observations upon growth from the viewpoint of statistical interpretation, H. C. SHERMAN and H. L. CAMPBELL (*Natl. Acad. Sci. Proc., 20 (1934), No. 7, pp. 413–416, figs. 3*).—From the extensive data which have accumulated in the authors' laboratory on the growth of white rats, tabulations and charts have been prepared to show the approximation to the degree of symmetrical distribution required for statistical interpretation of the gains in weight from the twenty-eighth to the fifty-sixth day of 1,458 males and 1,942 females on diet B (13), and the weight at 28 days of 5,285 males and 5,398 females from families on diet B and 3,092 males and 3,243 females from families on diet A (16). The values for skewness of the frequency distribution of the weights calculated in percentages of cases were −0.21, −0.28, −0.1, −0.07, −0.04, and −0.04 in the above order, respectively.

"Thus, for each sex, for two different segments of the growth cycle, and for experimental animals on three diets influencing distinctly different rates of growth, the growth data show so close an approximation to symmetrical frequency distribution as to add much to the confidence with which one may employ the usual methods of statistical interpretation."

Preliminary study of correlations on measurements on men and women students at Claremont Colleges, M. L. Ilsley (*Amer. Jour. Hyg., 19 (1934), No. 3, pp. 753–755*).—The four measurements considered in this preliminary study are blood pressure, height, weight, and physical fitness as measured by a modified Schneider test figure of 131 women and 90 men, first-year students at Claremont Colleges.

"The striking results in this preliminary study are (1) the association of greater physical fitness with heavier weight among women, as against lower physical fitness with heavier weight in men, (2) the association of lower physical fitness with higher blood pressure in both sexes, (2) the lack of association between physical fitness and height in either men or women, (4) the positive association of weight to blood pressure, and (5) the positive association between height and blood pressure in women, and the negative association of these variables for men, especially marked for those of the same weight."

Daily variations in calorie intake of a pre-school child, H. McKay (*Ohio Sta. Bimo. Bul. 168 (1934), pp. 118–121*).—The subject of this study was the youngest of the nursery school children serving as subjects in the long-time investigation noted previously (E.S.R., 71, p. 422), a normal girl 26 mo. old at the beginning of the study. The tabulated data include daily total calories and percentage of total calories derived from milk and from fruits and vegetables for 1 week in each of the four seasons of two consecutive years and maximum and minimum calorie intakes with the differences and percentage differences for each season.

The variations in calorie intake were quite marked for each week, ranging from 20 to 67 percent, with an average of 35 percent for the entire period of the study. There were no marked seasonal differences. The lowest intake was 878 calories for a Saturday in the winter period of the first year and the highest 1,675 for a Monday in the spring of the second year.

Among the factors considered to have an influence upon the calorie intake were irregularity in meals on days not spent in the nursery school, infection, overfatigue, food selection, and activity.

A possible explanation of the function of glutathione in developmental growth, F. S. Hammett (*Science, 79 (1934), No. 2055, p. 457*).—Observations concerning the developmental reaction of *Obelia geniculata* to the three amino acids of which glutathione is composed are summarized briefly. The chief function of cystine or cysteine is shown to be acceleration of cell multiplication, of glucose the regeneration of new hydranths from broken pedicels, and of glutamic acid the process of differentiation and consequent organization.

"Thus, then, it seems as if in glutathione nature has developed in one and the same chemical compound a complex which conditions if it does not determine the course of the several basic and essential processes concerned in developmental growth. Through cysteine it accelerates cell proliferation, the first step; through glycine it accelerates the protein reconstitution which is an essential accompaniment to both cell division and cellular differentiation; and through glutamic acid it accelerates the progress of that selective building up of the protein molecule which is the characterizing process of differentiation and its consequent organization."

Attention is called to the similarity in the observations concerning glycine to recent reports in the medical literature showing that glycine is sometimes of benefit in rebuilding muscle tissue.

Liquid paraffin: A cause of loss in weight in children? A. T. Till (*Jour. State Med., 42 (1934), No. 6, pp. 363–365*).—Attention is called to the possibility that in growing children large doses of mineral oil, if taken frequently and for a considerable period of time, may lead to loss of weight.

Three case reports are given in illustration. The theory is advanced that the loss in weight observed was due to the coating of the mucous membranes of the stomach and intestines with the oil, with resulting prevention of digestion and absorption of food.

Factors in food influencing hemoglobin regeneration.—III, Eggs in comparison with whole wheat, prepared bran, oatmeal, beef liver, and beef muscle, M. S. ROSE, E. McC. VAHLTEICH, and G. MACLEOD (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 217–229, figs. 6*).—This continuation of the series of papers noted previously (E.S.R., 69, p. 145) emphasizes the difficulties involved in attempts to determine the hemoglobin-regenerating properties of foods by the customary feeding experiments on rats rendered anemic by milk feeding.

The materials tested included dried whole egg, dried egg yolk or its ash alone and supplemented by ferric chloride or copper sulfate or both, dried liver, fresh lean beef, prepared bran and its ash, and combinations of the egg with whole wheat or bran, and of the liver with bran.

With sufficient iron, not less than 0.25 mg per day, the first limiting factor appeared to be copper, regeneration of from 10 to 11 g of hemoglobin occurring in 6 weeks only when the total copper was not less than 0.05–0.06 mg. In this connection attention is called to the necessity of taking into account the copper content of the milk consumed as well as of the food being tested. The milk used in the studies reported had an iron content of about 0.8 mg, and a copper content of about 0.27 mg per liter, but even with this low copper content milk in many cases furnished over 50 percent of the total copper intake.

On these levels of iron and copper, maximum regeneration was secured with wheat, oatmeal, and prepared bran, but not with liver or egg yolk. With the hydrochloric acid solution of the ash of each or with egg yolk or its ash supplemented with copper, the extent of hemoglobin regeneration did not exceed between 8 and 9 g per 100 cc of blood. In liver the form of the iron was found to be the first limiting factor and in egg yolk the copper content. A second limiting factor in the egg yolk was the form in which the iron occurred. With both egg yolk and liver there is thought to be a third, as yet unknown, limiting factor.

The role of the liver in the metabolism of carbohydrate and fat, C. H. BEST (*Lancet [London], 1934, I, Nos. 22, pp. 1155–1160; 23, pp. 1216–1221; 24, pp. 1274–1277*).—In three lectures delivered at the University of London in January 1934, the author discusses the subject under the headings methods of approach to the problem, the liver and carbohydrate metabolism, and the deposition of liver fat. Much of the discussion is based upon investigations in the author's laboratory, including some hitherto unpublished observations.

Excretion of ammonia and neutrality regulation, A. P. BRIGGS (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 231–238*).—Studies on the influence of various salts (potassium chloride, sodium chloride, and sodium sulfate) on the excretion into the urine of various acids and bases in the dog and man are reported, with the conclusion that the mechanism of ammonia excretion is not controlled by acid-base changes in the tissues, but that the excretion "is stimulated by and serves to neutralize the acid residue left in the tubules after resorption from the glomerular fluid of the alkaline threshold moiety."

This is thought not to be in conflict with present views concerning neutrality regulation. "The essential feature of neutrality regulation on an acid ash diet is resorption from the glomerular fluid of bicarbonate, along with water, glucose, and chloride. In states of alkalosis the tubules apparently reject bicarbonate."

Alterations in the calcium content of the blood in relation to the menstrual cycle, R. F. Matters and E. U. Hübbe (*Aust. Jour. Expt. Biol. and Med. Sci., 12 (1934), No. 1, pp. 19–23, figs. 6*).—A preliminary investigation noted previously (E.S.R., 62, p. 290) was extended to weekly blood calcium determinations for a period of 5 mo. for 11 normal women and daily determinations for a period of 3 mo. for another, with results which failed to confirm the previous findings of regular variations in the calcium content in relation to menstruation. There was some indication, however, of an increase in the calcium content of the blood at what is regarded as being the time of rupture of the Graafian follicles.

Magnesium deficiency in the rat, R. W. Brookfield (*Brit. Med. Jour., No. 3827 (1934), pp. 848, 849*).—A repetition of the magnesium-deficient dietary experiments of Kruse, Orent, and McCollum (E.S.R., 70, p. 560) on a group of 8 young piebald rats weighing from 65 to 107 g gave results in general agreement with those reported by Kruse et al. All but one of the animals died in from 21 to 41 days after showing symptoms similar to those previously reported, with the exception of hyperemia of the skin which was not noted. As the experimental period became more prolonged the convulsions were less severe. Acute degenerative changes were found in the liver and kidney, leading to the suggestion that the convulsions may be due not to tetany but to renal and hepatic dysfunction.

Magnitude of urinary iron excretion in healthy men, R. F. Hanzal and F. C. Bing (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, pp. 617, 618*).—The technic followed in determining the iron content of the urine consisted in evaporating a measured volume, usually 500 cc, of the fresh 24-hr. specimen to dryness in a silica dish, incinerating in an electric furnace at about 500° C. for 8 hr., dissolving the ash in dilute hydrochloric acid, making up to a volume of 50 cc, and removing aliquot portions for determining the iron by the thioglycolic acid method of Hanzal (E.S.R., 70, p. 154).

In 32 samples of clear urine from three healthy subjects the minimum and maximum values were 0.13 and 0.42, and the average values for the three subjects 0.2, 0.24, and 0.3 mg, respectively, per day.

Comparative chronic toxicities of fluorine compounds, F. DeEds and J. O. Thomas (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 824, 825*).—The minimal dose capable of producing chronic intoxication has been determined for four different fluorides. The criterion of toxic action was bleaching of the upper and lower (especially the lower) incisor teeth, present in all of the rats on a given dosage but absent when one-half the dosage was given. The materials tested and the toxicity as expressed in parts of fluorine per million of food are as follows: Sodium fluoride 12, sodium fluosilicate 15, barium fluosilicate 13.7, and sodium aluminum fluoride 24.3 parts. Attention is called to the uniformity of dosage as thus expressed for most of the compounds. It is calculated that from 0.5 to 1 mg of fluorine per day per kilogram body weight is capable of producing definite signs of injury to rat incisors. As calculated from the concentration of fluorine in drinking water capable of producing mottled enamel in children, an intake of from 1 to 2 mg of fluorine per day is toxic to a child. "Accordingly, human subjects appear to be more susceptible to flourine poisoning than do rats, and the data obtained on rats become all the more significant from the public health standpoint."

[Vitamin studies at the Alabama Station], G. A. Schrader, W. D. Salmon, and J. G. Goodman (*Alabama Sta. Rpt. 1932, pp. 19, 20*).—This progress report (E.S.R., 66, p. 893) includes a brief description of a respiration apparatus of the closed system type which has been developed for short respira-

tion periods with small rats, and summaries of studies dealing with the relation of vitamin B to the hemoglobin content of the blood of rats and pigeons and the effect of heating casein on the gains of rats on diets in which casein is the sole source of protein.

A study of canned shrimp with reference to the presence of vitamins A, B, and D, M. C. Moore and H. W. Moseley (*Science, 78 (1933), No. 2025, pp. 368, 369*).—Qualitative tests for vitamin A, B (complex), and D in wet-pack and dry-pack canned shrimps are reported.

No attempt was made to establish minimum protective doses, but the fat prepared by extraction with petroleum ether and evaporation at room temperature cured xerophthalmia and brought about resumption of growth in vitamin A-deficient rats in doses of from 0.2 to 0.3 g daily. In the vitamin B tests the canned shrimp was fed ad libitum, but afforded no protection in the quantities voluntarily eaten, about 3.5 g in the preventive and from 8 to 10 g in the curative tests. In the vitamin D experiments the shrimp fat showed distinct curative properties in doses of 0.2 to 0.3 g, representing from 10 to 15 g of the canned shrimp.

Effect of type of carbohydrate on vitamins B and G potency of feces voided by rats, N. B. Guerrant and R. A. Dutcher (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 796–800, fig. 1*).—In this contribution from the Pennsylvania Experiment Station, data obtained with the same technic as in an earlier study (E.S.R., 68, p. 866) are reported, indicating that in vitamin B and G studies coprophagy is of little consequence when sucrose is used as the sole source of carbohydrate, but that it does introduce serious errors when dextrinized cornstarch is the carbohydrate. The study is being extended to other carbohydrates.

Effect of prolonged feeding of raw carrots on vitamin A content of liver and kidneys in the dog, R. G. Turner (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 866–868*).—Data obtained by the colorimetric method according to the technic of Norris and Danielson (E.S.R., 62, p. 111) are reported on the vitamin A content of the liver and kidney of dogs which had been fed fresh carrots in amounts of 150 g daily over a prolonged period of time (2–8 mo.). Five dogs received a diet of meat, boiled rice, and fresh carrots, and three a similar diet plus 10 cc of cod-liver oil daily. Two, serving as controls, received only meat and rice. The data are calculated as animal units of vitamin A per gram of tissue, the value of an animal unit being defined as "that amount of vitamin A which produces a color equivalent to 10 Lovibond standard blue units. This amount restores normal growth to rats on a diet otherwise free from vitamin A."

In general the livers and kidneys from dogs kept for 63 days on the diet containing 150 g of carrots showed as high a content of vitamin A as those kept on the diet for 240 days. The average vitamin A values were 16.1 animal units per gram of liver and 7.53 units per gram of kidney. These amounts were about four times those found in corresponding organs of dogs receiving no carrots. The animals receiving cod-liver oil in addition to the carrots had no higher content of vitamin A. Spectroscopic examination indicated that the carotene from the carrots had been transformed into vitamin A.

Vitamin A of serum following administration of haliver oil in normal children and in chronic steatorrhea, J. Chesney and A. B. McCoord (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 887, 888*).—To test the value of colorimetric determinations of the vitamin A content of the blood serum as a measure of vitamin A absorption, 12 children who were considered to have no disorder in the absorption of fat were given 2 cc of haliver oil while

fasting. In the following 24 hr. the children ate meals of low vitamin A content, and blood was taken for analysis by the antimony trichloride test before and 2, 4, 6, 9, 12, and 24 hr. after the ingestion of the oil.

The maximum concentration of vitamin A, approximately 9 times the fasting level, was obtained 4 hr. after the ingestion of the oil. At 24 hr. the level was about 50 percent above the original level. In 2 children suffering from celiac disease the rise in vitamin A in the serum was much less and occurred later than in the normal child, and during the period of clinical improvement the rise was more marked. In 2 patients with chronic diarrhea and other symptoms suggestive of celiac disease, the vitamin A absorption curve was found to be normal, and the subsequent clinical course of these patients proved that they were not suffering from celiac disease. It is suggested that the test for vitamin A absorption may have diagnostic value in the chronic diarrheas.

The significance of an excess of vitamin A in the milk [trans. title], H. Fasold and H. Peters (*München. Med. Wchnschr., 80 (1933), No. 37, pp. 1427–1429, figs. 4*).—The possibility of increasing the vitamin A content of breast milk by administering a vitamin A concentrate to the mother during lactation is suggested by feeding experiments conducted on two groups of lactating rats, both of which received a diet of bread, wheat, carrots, cooked meat, and raw milk and one of them in addition 0.25 cc per rat per day of a commercial cod-liver oil concentrate Vogan.

The growth of the young of mothers receiving the concentrate was far in excess of that of the control group. The effect of the extra vitamin A in the mothers' milk was apparent for a considerable time after weaning on the twenty-first day, for on the fortieth day the young in the control group still weighed considerably less than those in the experimental group.

Without minimizing the importance of securing vitamin A as far as possible from natural foods, the authors point out that in times of greater need and of inability to secure vitamin A-rich food the use of concentrates is advisable.

The influence of avitaminosis on the course of trypanosomic infection, J. Fine (*Jour. Hyg. [London], 34 (1934), No. 2, pp. 154–156*).—In this contribution to the literature dealing with the disputed question of vitamin A as an anti-infective agent, the results are given of a comparison of the course of infection following subcutaneous inoculation with *Trypanosoma brucei* of two small groups of rats adequately provided with and deprived of vitamin A, respectively. The animals in the latter group were not inoculated until there was definite evidence of exhaustion of vitamin A reserves, as shown by xerophthalmia or stationary or falling weight.

In all of the animals in both groups trypanosomes appeared in the blood 3 days after the inoculation, and there were no significant differences between the two groups in survival times. The author concludes that "there is no significant difference between the course of *T. brucei* infection in the rat exhausted of vitamin A and that in the rat adequately supplied with this vitamin."

Vitamin B_1 and tissue oxidation, R. A. Peters and H. M. Sinclair (*Arch. Expt. Zellforsch., 15 (1934), No. 1, pp. 59, 60*).—The authors note that in extension of their previous work (E.S.R., 70, p. 153) they have found that "tissue respiration is at maximum in the brain system studied, if pyrophosphate and lactate are present together with α-glycerophosphate. α-glycerophosphate (not β) increases remarkably the respiration of normal pigeon's brain. Pyrophosphate added with lactate prevents in large part the rapid decrease in respiration noticed with minced pigeon's brain; neither alone has this effect.

Hexose mono- and diphosphates have no maintenance action. In the avitaminous brain, vitamin B_1 is needed to catalyze the lactate-pyrophosphate system."

Physiological experiments with vitamin C (ascorbic acid) and reductone (enol-tartronic aldehyde) [trans. title], H. v. EULER and E. KLUSSMANN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 217 (1933), No. 3-4, pp. 167-176*).—Tabulated data are given on the reaction with Tillmans' reagent of various organs of different species of animals.

The highest values reported were for the thymus of young rabbits and calves. The thymus of an old rabbit gave a much lower value. High values were also obtained with the livers of the cow, rabbit, pigeon, and man; considerably lower values for the livers of guinea pigs, both normal and scorbutic, and of the rat, for the kidneys of various species and the spleen, pancreas, and udder of the cow, and still lower values for muscle and milk. Negative results were obtained with blood serum.

Injection of adrenalin or methylene blue into the adrenals of various animals lowered the reducing power and of ascorbic acid increased it.

Biochemical studies on vitamin C and sugar derivatives. Reduction studies on sugar derivatives [trans. title], H. v. EULER and E. KLUSSMANN (*Arkiv Kemi, Min. och Geol., 11B (1933), No. 2, Art. 7, pp. 6; Art. 8, pp. 6*).—These two papers are essentially noted above.

Vitamin C in the human pituitary, J. GOUGH (*Lancet [London], 1934, I, No. 24, pp. 1279-1281*).—The determinations by Gough and Zilva of the ascorbic acid content of the human pituitary (E.S.R., 71, p. 279) have been extended to a total of 100 cases coming to autopsy. The reaction in the anterior lobe was most intense in young and middle-aged individuals in whom the general body nourishment appeared normal, less intense in the aged than in younger subjects, and slight or negative in individuals who had died of long-standing disease with severe emaciation. One of the cases was a child aged 5 mo. who had been fed wholly on condensed milk. It developed severe rickets and died of convulsions but with no outward signs of scurvy. The vitamin C test was very slight, however, in contrast to an intense reaction observed in breast-fed infants dying at the same age.

Vitamin C and the adrenal gland in the dog, H. M. VARS and J. J. PFIFFNER (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 839-841, fig. 1*).—Attempts to demonstrate a specific relationship between the adrenal glands of the dog and the synthesis and metabolic functioning of vitamin C in this species are reported with negative results. Six male dogs were adrenalectomized and kept alive with cortical hormone for periods of from 15 to 33 mo. without any of the recognized symptoms of scurvy on diets shown to be devoid of vitamin C. The cortical hormone was also proved to be free from vitamin C. The feeding of large amounts of vitamin C to the adrenalectomized dogs caused no change in the requirement of the cortical hormone.

The authors conclude that if the adrenals do play any role in the metabolism of vitamin C it must be through the action of the adrenal cortical hormone.

Urinary excretion of vitamin C, A. F. HESS and H. R. BENJAMIN (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 855-860*).—Using the microchemical method of Birch, Harris, and Ray (E.S.R., 70, p. 741), the authors determined the ascorbic acid content of the urine of children before and after the ingestion of large doses of vitamin C in the form of orange juice or "cevita" (ascorbic acid) tablets. Similar studies were made of the ascorbic acid content of the urine of guinea pigs, rabbits, and rats.

Under ordinary dietary conditions the amount of vitamin C present in human urine was so small as to be almost negligible. After feeding excessive doses

of vitamin C a rise in the ascorbic acid of the urine occurred, but not until the fourth day of high feeding, when the increase was abrupt and very marked. When the feeding of vitamin C was stopped, an immediate reduction in its excretion in the urine occurred. These findings are interpreted as indicating that in the human species after the body stores have become completely saturated with vitamin C the excess is quickly eliminated in the urine.

In the other species examined the initial concentration of vitamin C in the urine was higher than in man, but feeding large amounts brought about no increase in excretion. Only when the vitamin was injected intraperitoneally was there any marked increase in its excretion. In the guinea pigs there was no difference in the initial vitamin C concentration in the urine or response to vitamin C ingestion between normal animals and those suffering from moderate scurvy.

The effect of freezing upon vitamin C of apples, S. S. Zilva, F. Kidd, and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, p. 89*).—Based on tests for antiscorbutic properties, Bramley Seedling apples frozen at −5° C. lost practically all their vitamin C, at −10° the loss was less (about 50 percent), at −15° the loss was only appreciable, and at −20° there was no loss at all.

The effect of stock upon vitamin C of apples, S. S. Zilva, F. Kidd, and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1932, p. 91*).—Determination of vitamin C activity in the fruits of Bramley Seedling, a variety potent in vitamin C, and in Cox Orange Pippin, a less potent variety, both budded on three stocks, namely, broad-leaved English, Doucin, and Jaune de Metz, showed no influence of the stock on the vitamin C content of the fruits.

The commercial assay of vitamin-D, W. A. Broom (*Jour. Soc. Chem. Indus., Trans., 52 (1933), No. 16, pp. 105T–108T, figs. 3*).—An examination of existing methods for the quantitative determination of vitamin D has led the author to combine and modify the line test and radiographic test "to permit the determination of the initial rachitic condition of all the animals used in the test and to allow the final examination of the healing produced to be made from photographs of bones prepared according to the technic of the line test.

"It is our experience that by the use of this modified method we can (1) insure an approximately constant rachitic condition in the test animal; (2) determine the degree of rickets of every animal before feeding the test substances; (3) eliminate any animals which have not developed rickets to the same extent as their litter mates; (4) vary the length of the test period from 7 to 14 days in order that the average healing produced by the same dose of standard preparation may be approximately the same from test to test; (5) obtain permanent photographic records of the healing produced in each animal."

***Studies of incurable rickets.*—I, Respective rôle of the local factor and vitamin D in healing,** A. E. Sobel, A. R. Goldfarb, and B. Kramer (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 869, 870*).—A comparative study of the production and cure of rickets in rats on diets containing 3 percent of $CaCO_3$ and 3 percent of $SrCO_3$, respectively, is reported, with the following conclusions:

"The substitution of strontium for calcium in the rickets-producing diet produces a form of rickets which fails to respond to the very large amounts of vitamin D. The endochondral cartilage of strontium-fed animals, both treated and untreated, fails to calcify when incubated in artificial serum solution even with a Ca × P product of 60 which produces marked calcification in

the endochondral cartilage of control rachitic rats. These observations strongly suggest an injurious effect of strontium upon the 'local factor' in the hypertrophic cartilage of the provisional zone of calcification which brings about calcification at this area when conditions in the serum are favorable. The ability of vitamin D to cause an increase of the Ca × P, even when healing does not take place, implies that this raising of the product is the function of the antirachitic vitamin in the cure of rickets."

Vitamin E.—I, Some chemical and physiological properties, H. S. Olcott and H. A. Mattill (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 423–435*).—This paper reports the results of a systematic investigation of various aspects of the chemical and physiological problems concerned with vitamin E, extending and in most cases confirming the work of Evans and Burr (E.S.R., 58, p. 595). The curative method developed by these authors was used throughout and is described in detail.

Studies on the relation of the quantity of vitamin E administered to the duration of fertility and survival of the young and on the paralysis of suckling young of rats on a vitamin E-deficient diet confirmed in every way the early observations of Evans and Burr. Concentrates were prepared from lettuce by the method previously described (E.S.R., 66, p. 608) and from wheat germ oil by a slight modification of the method of Evans and Burr and their physical and chemical constants determined, with results pointing to the identity of the vitamin from these two sources. The chemical reactions of the concentrate were the same as reported by Evans and Burr with the exception of acetylation, which had no destructive effect. Contrary to all previous work, including that of Cummings and Mattill (E.S.R., 66, p. 94), on the susceptibility of vitamin E to oxidative destruction in rancid fats, purified concentrates of vitamin E even in the absence of an inhibitor proved very resistant to this type of destruction.

In view of the suggestion of Verzár (E.S.R., 69, p. 904) of a possible relationship between vitamin E and the sex hormone of the anterior pituitary, a comparison was made of the effect of a vitamin E concentrate and the sex hormone hebin on the opening of the vagina of immature rats. The vitamin E concentrate was without effect, while hebin brought on oestrum.

No relationship between xanthophyll and vitamin E, as suggested by Von Euler and Klussmann (E.S.R., 69, p. 467), could be demonstrated.

In a footnote a brief summary is given of quantitative tests for vitamin E in various food materials. Palm oil and palm kernel oil were found to contain little or no vitamin E, cottonseed oil and hydrogenated cottonseed oil to be richer in vitamin E than heretofore supposed, and olive oil to contain it in appreciable amounts.

Experiments on vitamin G concentration and possible supplementary relationships with the vitamin G deficient diet, J. W. Page, Jr. (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 779–783, fig. 1*).—A concentrate of vitamin G was prepared from air-dried skim milk powder by refluxing 500 g of the powder successively with 2,000, 1,250, and 750 cc of neutral boiling 93 to 94 percent (by weight) ethyl alcohol for 30, 30, and 15 min., respectively, constant agitation being maintained by means of a stream of purified nitrogen. The three alcoholic extracts were combined, dried, and analyzed for nitrogen and phosphorus, and both the alcoholic extract and extracted milk powder were tested for vitamin G potency.

The dried extract contained 4.44±0.02 percent of nitrogen and 0.47±0.01 percent of phosphorus. Half of the total G activity was in the alcoholic extract and half in the extracted powder, the extract being 10 times as rich in vitamin G as the powder.

Attempts to concentrate the vitamin still further by reducing the alcoholic extract to a small volume by distillation under reduced pressure and adding to the concentrated extract an equal volume of ethyl ether gave a precipitate containing 3.49±0.05 percent nitrogen and 0.255±0.005 percent phosphorus, but only 4 times as rich in vitamin G as the original powder. The loss in activity could not be accounted for in the alcoholic filtrate when the supplementing effect of one for the other was tested, following the technic described by Stiebeling (E.S.R., 68, p. 568). It was noticed, however, that rats kept beyond the usual 5 weeks' period on the alcohol-extracted powder as the source of vitamin G often showed a sharp decline in weight. When rats were kept on the G-deficient diet for 56 days instead of 21 to 28 days, an amount of the alcohol-extracted powder which had promoted growth after 4 weeks was practically inactive when fed as the G supplement alone, but when fed in combination with the extract it increased the growth-producing property of the latter.

It is suggested that a long depletion period results in depleting the body reserves of the rat of a second limiting factor which is carried by the extract only.

The practicability of the anticoprophagy harness previously described (E.S.R., 69, p. 469) was verified by a further comparison of the gains in weight of unharnessed and harnessed rats. At the end of the fifth week the average total gain of the group of harnessed rats was 18.8±1.2 g and of the unharnessed 29.4±2.2 g.

The influence of nutrition upon resistance to infecton, S. W. CLAUSEN (*Physiol. Rev.*, *14* (*1934*), *No. 3*, *pp. 309–350*).—In this critical review of the literature, the relation of the various vitamins and certain other factors to the resistance of experimental animals to infection is first discussed. The other main sections of the review deal with humoral resistance to infection as affected by deficiencies in protein and minerals and in vitamins C, A, and D; tuberculosis in man as affected by similar deficiencies, and the relation of various deficiencies, particularly vitamins, to resistance to infection in infants and young children and in older children and adults.

From the evidence discussed, the author concludes that the "susceptibility to infection is not as a rule affected by diet. Resistance to infection, on the other hand, may be greatly reduced by deficient diet. A deficiency in the diet of vitamins A and C appears quite definitely to lower resistance to infection. In certain cases, a lack of the vitamin B complex may also do the same thing. A lack of vitamin D cannot be said to have a proved effect in lowering resistance. It seems probable that the existence of a partial deficiency of vitamins may result in loss of resistance to infection, though this cannot be said, from the present evidence, to have been clearly established."

In closing, various suggestions are made as to lines for future investigation. "We need a search for the existence of anti-infective substances other than the ones already recognized in natural foodstuffs, e.g., fruit juices. We need the use of highly purified vitamins in experiments designed to study the question of partial deficiencies. We need to use and perfect chemical methods for analysis of tissues and foodstuffs. We need a more careful study of tissue reactions in animals suffering from food deficiencies and infections, and finally more carefully planned experiments dealing with partial and multiple deficiencies."

An extensive list of literature references is appended.

Aids in the study of dental caries with albino rats, I. NEUWIRTH and P. BRANDWEIN (*Science*, *79* (*1934*), *No. 2037*, *pp. 36, 37*, *figs. 2*).—Brief descrip-

tions are given, with illustrations, of procedures for handling rats in making periodical examinations of the teeth and for collecting blood for determining inorganic constituents.

Table showing the pellagra-preventive value of various foods, W. H. SEBRELL (*Pub. Health Rpts.* [*U.S.*], *49* (*1934*), *No. 26, pp. 754–756*).—In this table, which is intended primarily for use in the treatment and prevention of pellagra, only those foods are included which have been tested under control conditions on both human beings and dogs. The tabulated items include the foods tested, classified by food groups, the quantities administered daily, the pellagra-preventive values classified as good, fair, slight, and none, and literature references. In the classification *good* signifies that in the quantity indicated and under the conditions of the experiment the food contains enough of the pellagra-preventive factor to prevent the disease; *fair*, that under the same conditions the food contains enough of the vitamin to be of value, but should not be relied on alone for the prevention or cure of the disease; and *slight*, that the food may cause a slight delay in the onset of the disease, but is of no practical value.

Among the foods classed as *good* are fresh and corned beef, canned chicken, dried pork liver, buttermilk, canned collards, kale, and green peas; juice from canned tomatoes; and canned turnip greens.

A list of 18 references to the literature is appended.

The pellagra-preventive value of green onions, lettuce leaves, pork shoulder, and peanut meal, G. A. WHEELER and D. J. HUNT (*Pub. Health Rpts.* [*U.S.*], *49* (*1934*), *No. 25, pp. 732–736*).—As determined by the methods used in previous studies of the series (E.S.R., 70, p. 282), canned immature green onions, including the tops, were shown to have a slight protective value for human subjects in daily rations of 502 g. Canned green leaves of the Cos or Romaine variety of lettuce also gave slight protection in a ration of 516 g. In both cases the canned liquor was included. The lean meat from steam-cooked smoked pork shoulder gave complete protection in quantities of 200 g. daily, and commercial peanut meal thoroughly cooked in a steam cooker also gave complete protection at the same dosage. Both of these food materials are considered good sources of the pellagra-preventive factor.

MISCELLANEOUS

Forty-third Annual Report [of Alabama Station], 1932, M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1932, pp. 29*).—The experimental work reported is for the most part referred to elsewhere in this issue.

Annual report of the director [of the Delaware Station] for the fiscal year ending June 30, 1933, C. A. MCCUE ET AL. (*Delaware Sta. Bul. 188* (*1934*), *pp. 47*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

The Forty-sixth Annual Report of the Maryland Agricultural Experiment Station, [1933], H. J. PATTERSON (*Maryland Sta. Rpt. 1933, pp. XXXVIII+155–569, pl. 1, figs. 89*).—In addition to experimental work previously noted or referred to elsewhere in this issue, this report includes reprints of Bulletins 337–350.

Abstracts of Bulletins 474–488, Circulars 67–68, and other publications during 1933, A. D. JACKSON (*Texas Sta. Circ. 71* (*1933*), *pp. 28*).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere, for the most part previously noted or abstracted elsewhere in this issue.

NOTES

Colorado College and Station.—R. D. Hockensmith, associate in agronomy, has resigned to accept a position with the U.S. Farm Credit Administration, with headquarters at Wichita, Kans., and has been succeeded by James B. Goodwin. W. W. Austin has resigned as assistant agronomist to become assistant extension agronomist and has been succeeded by Dean C. Anderson.

A. M. Binkley, acting head of the department of horticulture, has been granted a year's leave of absence for graduate work at Cornell University. Dr. Louis R. Bryant has been appointed assistant in horticulture.

Connecticut [New Haven] Station.—The station is actively engaged in laboratory research and measures for the control of the Dutch elm disease in Connecticut. During the past year members of the forestry and botany departments have cooperated with the Federal office for the control of the disease located at Stamford. A single case of the disease appeared in Glenville, Fairfield County, about January 1, and since that time 55 other trees, mostly in the vicinity of Greenwich, have been found to be infected. Plans presented by Director W. L. Slate to Governor Wilbur L. Cross in August for a State-wide survey of elm trees have been approved, and the work is going forward under the direction of Dr. G. P. Clinton and W. O. Filley of the station staff. Thus far only a single specimen of elm outside of Fairfield County of those submitted for laboratory examination has been found infected.

T. R. Swanback, agronomist of the Tobacco Substation at Windsor, has been granted six months' leave of absence for plant physiology studies at the University of Stockholm.

Georgia Station.—Dr. Benjamin W. Hunt, a member of the board of trustees from 1916 to 1931, died June 26 at his home at Eatonton at the age of 87 yr. A banker by profession, he gave much attention to agricultural and horticultural matters. He was influential in the local development of the dairy industry and in the suppression of contagious abortion and the cattle tick. He was also an authority on hardy palms and plant breeding and the first to cross artificially the mule fig in the South. He had been president of the State Horticultural Society, and was awarded the honorary D.Sc. degree by the University of Georgia in 1922.

N. M. Penny was added to the staff August 20 as collaborator in the cotton grade and staple studies conducted in cooperation with the U.S.D.A. Bureau of Agricultural Economics. Miss Mary Speirs has been appointed assistant home economist, beginning October 1.

Idaho University and Station.—Dr. Clarence C. Vincent, professor of horticulture and horticulturist since 1914 and associated with the college and station since 1910, died August 19 at the age of 50 yr. Dr. Vincent was a native of Oregon, receiving the B.S. and M.S. degrees from the Oregon College in 1907 and 1909, as well as the M.S. degree from Cornell University in 1910 and the Ph.D. degree from the Massachusetts College in 1929. He had also held horticultural appointments in the Oregon College and Clemson College.

Illinois University.—Dr. Frank L. Stevens, professor of plant pathology since 1914 and internationally known for his contributions in the field of

tropical fungi, died August 18 at the age of 63 yr. He was a native of New York, graduating from Hobart College, as well as Rutgers College (B.S. 1896 and M.S. 1897), and had received the Ph.D. degree from the University of Chicago in 1900 and honorary degrees from the University of San Marcos, Peru, and the University of Glasgow. In addition to his service in Illinois, he had been professor of botony and plant pathologist in the North Carolina College and Station from 1902 to 1912, dean of the College of Agriculture of the University of Puerto Rico from 1912 to 1914, and in 1930–31 holder of the Baker memorial professorship in the University of the Philippines. He was the author of numerous textbooks, had been associate editor of *Phytopathology* and the *Journal of Bacteriology*, and served as president of the American Phytopathological Society in 1910.

Iowa College and Station.—In cooperation with the U.S.D.A. Bureaus of Plant Industry, Agricultural Engineering, Chemistry and Soils, and Agricultural Economics, the station is organizing what is known as a corn research institute, apparently the first in the United States. The objectives of this institute are to encourage and coordinate all corn (maize) research in Iowa and to increase its usefulness, to secure adequate recognition of the importance of such research, and to obtain increased support for it.

The institute will be composed primarily of research workers interested in problems relating to corn in Iowa, with a small coordinating executive committee and a larger advisory committee. The executive committee will consist of the vice director of the station, Dr. W. H. Stevenson (designated chairman during organization phases of the institute), the director of the station, and two members of the resident staff chosen from the advisory committee, at least one representing the U.S. Department of Agriculture. The advisory committee will consist of the director of the station, chairman, the dean of agriculture, the director of agricultural extension, the assistant in agriculture to the president of the college, and the vice director of the station.

A meeting of the institute will be held November 15 and 16 in conjunction with a symposium commemorating 60 yr. of laboratory teaching in the botanical sciences to be held at Iowa State College. It is expected that Secretary of Agriculture Henry A. Wallace will give an address.

The personnel for the experimental erosion control nursery (E.S.R., 70, p. 894) has been largely determined. A. L. McComb has been appointed acting director, with Albert Dodge and Hugh Steavenson, technical assistants in charge of experimental field work. Jess Fults and V. T. Stoutemeyer of the U.S.D.A. Bureau of Plant Industry and Plant Quarantine have been appointed propagators, the former to work principally on the propagation and sources of grasses and other herbaceous materials suitable for testing and the latter on the propagation of trees and shrubs.

School and Society notes that Sarah Porter Ellis has succeeded Neale S. Knowles as State home demonstration leader.

New Mexico College and Station.—The college has recently purchased approximately 60 acres of irrigated land for experimental work in agronomy.

P. W. Cockerill, assistant agricultural economist, has been appointed agricultural economist effective September 1, vice A. L. Walker resigned. R. P. Callaway and W. B. Morrow have been appointed assistants in agricultural economics and agronomy, respectively.

New Journals.—*Journal of the Chinese Chemical Society* is being published quarterly, the editor being C. L. Tseng, Department of Chemistry, National University of Peiping. The initial number contains, among others, the following English articles: Chemical Studies on Chinese Silk—I, The Glycine,

Alanine, and Tyrosine Contents of Chekiang Silk, by P. P. T. Sah and T. S. and S. Y. Ma (pp. 17–22); Studies on Chinese Citrus Fruits.—I, Vitamins A and B in the Peels of Fu Chü (Chinese Tangerine), by P. P. T. Sah (pp. 23–28); The Estimation of Soybean Milk Used as an Adulterant in Cow's Milk, by W. H. Adolph and E. F. Yang (pp. 29–34); and Use of Some American Brands of Decolorizing Carbon in the Preparation of *d*-Glutamic Acid Hydrochloride by Hydrolysis of "Wheat Gluten", by C. L. Tseng and E. J. H. Chu (pp. 35, 36).

The Cane Growers' Quarterly Bulletin is being published by the Bureau of Sugar Experiment Stations at Brisbane, Queensland, primarily for the use of individual planters. The initial number contains the following articles: The Control of Sugar Cane Diseases, by A. F. Bell (pp. 1–7); Experiments in Grub Control in the Lower Burdekin District (p. 7); A New Implement—the Stubble Shaver (pp. 8, 9) and Irrigation Principles (pp. 10–19), both by H. W. Kerr; The Spread of Fiji Disease by Insects, by R. W. Mungomery and A. F. Bell (pp. 2023); P.O.J. 2878 in the Moreton District (pp. 23–25); Fertilizer for Ratoons (p. 25); Sugar-Cane Quarantine Districts (p. 26); and Cane Ripening and Maturity Testing, by H. W. Kerr (pp. 26–30).

Proceedings of the Helminthological Society of Washington is being published from time to time under the editorship of Jesse R. Christie, U.S.D.A. Bureau of Plant Industry, Washington, D.C. The initial number consists mainly of short contributions by members, for whose use the journal is primarily intended, but it is announced that papers on helminthology, medical entomology, protozoology, parasitology, and related subjects will be accepted "provided the author will contribute toward the cost of publication."

Bulletin of Applied Botany, of Genetics, and Plant Breeding, published by the Institute of Plant Industry of the Lenin Academy of Agricultural Sciences, Leningrad, has added Series 13, Reviews and Bibliography. The initial number in this series contains about 300 abstracts in Russian, but with titles and other bibliographical data in the original language as well. A bibliography of about 70 pages on the potato, embracing a selected list of foreign publications up to 1930, is appended.

Ganaderia, a quarterly review of veterinary medicine and zoology, is being published by the Veterinary High School of Córdoba, Spain. The initial number contains an account of this school as well as several original articles, among them Investigation of Genotypes, by D. Gumersindo Aparicio (pp. 13–23), and The Differentiation of *Piroplasma caballi* and *Nuttallia equi*, by N. Almarza Herranz (pp. 24–37).

Agricultura is being issued monthly as the official organ of the Secretary of Agriculture and Public Works at México, D.F. Among the articles in the initial number is one by J. Rulfo entitled Importance of Establishing Agricultural Experiment Stations (pp. 67–69).

Farm and Machine is being published by the Institute for Research in Agricultural Engineering of the University of Oxford. The initial number contains the report of the institute for the year ended with September 1933 and a number of miscellaneous papers on the various activities.

EXPERIMENT STATION RECORD

Vol. 71 December 1934

EDITORIAL

THE SEMICENTENNIAL OF THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS

The 1934 annual meeting of the Association of Official Agricultural Chemists, held in Washington, D. C., from October 29 to 31, was an occasion of unusual interest, since it was the fiftieth to be held by the oldest of the many groups of workers in agricultural science now in existence in this country. Formally organized in Philadelphia on September 9, 1884, nearly 3 yr. before the passage of the Hatch Act and at a time when the Society for the Promotion of Agricultural Science was the only professional organization in the field, the association has maintained a record of uninterrupted service which has been of unique value and wide influence.

The immediate concern of the association in its early days was the composition and reliability of the commercial fertilizers coming on the market. As one State after another had attempted the regulation of the new industry, the need for an official organization to authorize and unify methods of analysis was increasingly realized. Following a suggestion of Mr. R. J. Redding, afterward director of the Georgia Experiment Station, a call was issued as early as 1880 by the Georgia State Commissioner of Agriculture which resulted in two meetings held in Washington and one in Boston during the year, as well as meetings in Cincinnati in 1881 and Atlanta in 1884. Considerable preliminary work was done at these meetings in working out uniform methods of analysis, but differences in point of view between official and trade chemists were among the causes delaying permanent organization.

As eventually constituted, the association was restricted in its membership to "analytical chemists associated with departments of agriculture, State experiment stations, and State boards exercising an official fertilizer control." Subsequently this provision was broadened to include chemists of provincial or national institutions in North America. This provision brought the benefits of Canadian membership, exemplified at the recent meeting by the president, Dr. R. Harcourt of the Ontario Agricultural College.

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As stated in the first constitution, the object of the association was defined as "to secure, as far as possible, uniformity in legislation with regard to the regulation of the sale of commercial fertilizers in the different States and uniformity and accuracy in the methods and results of fertilizer analysis." Two years later, however, the scope of its interests was extended to include "soils, cattle foods, dairy products, and other materials connected with agricultural industry," and provision was made for the discussion of "matters of interest to agricultural chemists." In 1914 foods and medicinal plants and drugs were specifically added.

Methods for the determination of phosphorus and potash were tentatively adopted at the first meeting, and standing committees were set up for each of these elements and nitrogen to test methods in collaboration with coworkers of the association and others and report at each annual meeting. In 1888 reporters (later designated referees) were substituted for these committees, and machinery was in due time set up for handling their recommendations in an adequate and orderly way. The methods thus approved found immediate application in regulatory work, research, and elsewhere. Compilations published in 1895 by the U. S. D. A. Bureau of Chemistry found wide utilization, and the later revisions, handled since 1916 by the journal and other publications of the association itself, have been a considerable factor in maintaining the professional standing and prestige of agricultural chemists in general.

Much of the influence speedily achieved by the association may doubtless be attributed to the character of its early leadership. The first officers to be elected consisted of Dr. S. W. Johnson of Connecticut as president, Dr. H. C. White of Georgia as vice president, and Dr. C. W. Dabney, then of North Carolina, as secretary-treasurer, with Drs. E. H. Jenkins of Connecticut and H. W. Wiley of the Division of Chemistry as additional members of the executive committee. This was a group which would doubtless have been regarded as outstanding at any time during the half century, and was effectively supplemented by many others of well-deserved prominence.

The service of these pioneers was fittingly recalled at a commemorative dinner, held during the anniversary meeting, by Dr. C. A. Browne of the Bureau of Chemistry and Soils. Dr. Browne's paper dealt especially with the personal influence of these leaders. He paid special tribute to their ideals of service, breadth of vision, and insistence upon what President C. G. Hopkins termed in his remarkable address in 1906 the uncompromising "accumulation of facts, duplicated and multiplied, until are solved with certainty the foundation problems of a permanent and prosperous American agriculture."

As Dr. Browne made clear, the high quality of the early leadership has been largely sustained despite the increased specialization among agricultural chemists and their differentiation into regulatory, research, and other fields. This retention of interest in the work of the association has been due in part to a realization of the basic importance of adequate methods, but has also been fostered by a policy developed especially during the past decade of supplementing the judicial functions of the association as to technical details by opportunities for the consideration of some of the broader questions of the day. Where formerly the president's address, and later the annual dissertations of Dr. Wiley, were the main mediums for such general presentations, the Wiley memorial address and a number of other specially scheduled papers each year now perform a useful function of diversification and enlightenment. This year the president's address dealt with problems in the chemistry of wheat. The Wiley address, the fourth in the series, was given by Dr. W. D. Bigelow, long associated with Dr. Wiley, on the topic Food Preservation in Relation to Public Health. A paper by Dr. H. G. Knight, Chief of the Bureau of Chemistry and Soils, was entitled The Problem of Selenium.

The association is to be congratulated on its 50 yr. of useful attainment, but perhaps even more because of its consistent adherence to what President A. E. Paul termed in his address in 1932 "conservative progressiveness." Necessarily conservatism has been the most fundamental doctrine in its creed, but marked progressiveness has also characterized many of its developments, and its field of operation has been materially broadened in response to changing conditions. As President Paul well pointed out, the association has been "decidedly progressive in the matter of entering new fields, in taking up new subjects, and in studying new methods, but it is unique in its conservatism in finally adopting methods. . . . No other agency in this or any other country, so far as we are aware, parallels it, and as a result it merits the unique distinction of authority which is accredited to it by the chemical world."

Thus the association may be felicitated upon its attainment of the maturity and wisdom of age without sacrifice of the vision and adaptability of youth. It has made a creditable record of tangible achievement in an era when it was greatly needed. Its maintenance of a broad and progressive outlook should do much to perpetuate its influence and extend its usefulness.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Standardization of vitamins (*Brit. Med. Jour., No. 3836 (1934), p. 77*).—In this brief report of the Second International Conference on the Standardization of Vitamins, held in London from June 12 to 14, 1934, under the chairmanship of E. Mellanby, it is announced that the standards for vitamin B_1 and D remain the same as adopted at the first conference (E.S.R., 67, p. 480), and that new standards have been adopted for vitamins A and C. For vitamin A pure β-carotene is to replace the standard preparation of carotene previously recommended. For vitamin C the new standard is crystalline ascorbic acid.

Recent developments in pharmacopeial vitamin standardization (*Jour. Amer. Med. Assoc., 102 (1934), No. 22, pp. 1877, 1878*).—Essentially noted from another source (E.S.R., 71, p. 298).

The stability of carotene in olive oil, R. G. Turner (*Jour. Biol. Chem., 105 (1934), No. 2, pp. 443–454, figs. 4*).—A preliminary study of the stability of carotene in olive oil (E.S.R., 69, p. 467) has been extended to observations on the stability of a 0.2 percent solution of carotene in olive oil or ethyl laurate, with and without various organic stabilizers, over a period of from 12 to 17 mo. The stabilizers included 0.1 percent hydroquinone, 0.1 percent quinhydrone, and a mixture of 0.05 percent each of quinhydrone and hydroquinone. Five-cc samples of the carotene solution alone and with each of the stabilizers were placed in small test tubes, sealed, and kept at room temperature in the light and in the dark, in an oven at 37.5° and 100° C. in the dark, and in the refrigerator at 10° in the dark. All of the tubes were opened and exposed to the air for 5 min. each day, and the rate of fading in each was measured in a Lovibond tintometer, using the red units only. The destruction of the carotene, as judged by the color tests, is summarized as follows:

"The rate of fading is approximately the same for solutions of carotene in olive oil and solutions of carotene in ethyl laurate when stabilizers are present. Without stabilizers destruction is more rapid in solutions of carotene in ethyl laurate. Complete loss of color is observed in 3 to 4 mo. at room temperature. With olive oil as the solvent complete loss of color was observed at from 6 to 9 mo. With stabilizers present, solutions tend to hold their red pigmentation at a level of 6 to 7 red Lovibond units for a period of 12 to 17 mo. Their activity at this time is approximately one-half the original potency. Apparently the loss of potency in solutions of carotene of high concentration is not due entirely to the conversion of the active form to the inactive form. A slow precipitating out of solution until a saturation point is reached is thought to be another cause for loss in color and potency of carotene solutions."

Solutions of the carotene in olive oil were tested biologically for vitamin A before and after storage at room temperature in the dark for 1 yr. with hydroquinone alone and with quinhydrone as stabilizers. Under these conditions the carotene showed a loss of about half of its original vitamin A potency.

Oxidation-reduction potentials of ascorbic acid, J. S. Fruton (*Jour. Biol. Chem., 105 (1934), No. 1, pp. 79–85, figs. 2*).—"A method is described for the determination of the oxidation-reduction potentials of reversible systems by the use of dyes. This method, when applied to ascorbic acid, shows that this system behaves reversibly between pH 5.5 and pH 7.5. The potential of ascorbic acid at pH 7 is −0.081 v."

Glucoreductone for the standardization of 2,6-dichlorophenolindophenol solutions used for the estimation of ascorbic acid (vitamin C), Z. I. Kertesz (*Jour. Biol. Chem., 104 (1934), No. 3, pp. 483–485, fig. 1*).—A simple method for the standardization of the indophenol indicator solution of Tillmans et al. (E.S.R., 69, p. 7) for the quantitative titrimetric determination of ascorbic acid is proposed in this communication from the New York State Experiment Station.

The method consists in preparing glucoreductone from glucose under standardized conditions, which are described in detail, and using the reaction mixture immediately for titrating a small amount (0.1–0.5 cc) of the indicator solution from a microburette according to the Birch, Harris, and Ray (E.S.R., 70, p. 741) modification of the Tillmans method. One cc of the glucoreductone prepared as outlined is equivalent to 0.25 mg of ascorbic acid.

Some chemical properties of vitamin E, H. S. Olcott (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., p. LXV*).—"In continuation of work toward the isolation and identification of vitamin E [E.S.R., 71, p. 731], the following observations have been made: The inactive product obtained by mild bromination of vitamin E concentrates can be reactivated by boiling with Zn dust and HCl in methanol solution. Vitamin E was not destroyed by the catalytic hydrogenation of concentrates at 200° [C.] and 200 atmospheres pressure, but the concentrates, after such treatment, were still unsaturated, as indicated by iodine number determinations. An active concentrate of vitamin E has been prepared from crude cottonseed oil. An absorption band with a maximum at 2,940 a.u. has been detected in the most active fraction."

Note on the preparation and fractionation of the α-naphthylisocyanate compound of plastein, S. J. Folley (*Biochem. Jour., 27 (1933), No. 1, pp. 151, 152*).—"From a weakly alkaline 1 percent solution of the α-naphthyl isocyanate compound of plastein containing 3 percent NaCl, two substances of different basicities were obtained. The first substance was precipitated by saturation of the weakly alkaline solution with CO_2. This fraction was filtered off and the second substance precipitated by addition of acetic acid. By separately subjecting each fraction to repetitions of this process, each was freed from traces of the other, and finally two quite sharply differentiated substances were obtained.

"Exhaustive alcoholic extraction of these two substances in the Soxhlet apparatus yielded in each case a substance soluble in warm alcohol and a residue insoluble in alcohol. Both alcohol-soluble fractions were repeatedly extracted by prolonged shaking with large quantities of cold absolute alcohol. Both yielded as a result of a long series of operations three subfractions, namely, a substance soluble in warm absolute alcohol but insoluble in the cold, a substance soluble in cold absolute alcohol, and a small quantity of reddish alcoholic solution containing the most soluble fractions, together with possible decomposition products of the α-naphthyl isocyanate compound resulting from the treatment with alcohol."

The chemical changes induced in wood by saturated steam under pressure, W. G. Campbell and K. F. Taylor (*Biochem. Jour., 27 (1933), No. 1, pp. 158–164*).—The authors' experiments indicate that when wood is heated by means of saturated steam under pressures ranging from 20 to 80 lb. per square

inch, it may undergo chemical change similar to that occurring when heat is applied by other means, but the initial process took place more rapidly and at temperatures as low as 100° C. The greater part of the residues consisted of pentosans in hardwoods and hexosans in softwoods. There was found to be a temperature, dependent upon the conditions under which the wood is heated, below which the residues condense to a product insoluble in 72 percent sulfuric acid and above which they are more or less completely hydrolyzed to reducing sugars. Part of the reducing sugars could even be decomposed into volatile products. The temperature at which the tendency toward hydrolysis of depolymerized units is greater than the tendency toward condensation to a lignin-like product was found to be lower in the case of hardwoods than in that of softwoods.

A constant-volume differential manometer, F. Dickens and G. D. Greville (*Biochem. Jour., 27 (1933), No. 1, pp. 213–219, figs. 3*).—In discussing the principle of the instrument here described and illustrated, the authors state that "this manometer differs from those previously described in that both vessels are kept at constant volume. Each vessel is attached rigidly to its manometer limb, but each limb can be moved up and down independently of the other, as the lower ends are connected only by a length of rubber pressure tubing filled with manometer fluid. . . . By raising or lowering one vessel with respect to the other, the meniscus in each limb is kept at a given mark on that limb, so that each vessel is kept at constant volume. The difference in pressure between the two vessels is then given in terms of height of manometer fluid by the vertical distance between the marks on the two limbs", and the corresponding gas volume is derived from this pressure change by multiplication by a simple vessel constant. "The instrument thus combines the differential manometer's advantage of compensation with the simple manometer's simplicity of reading and calculation."

A vacuum evaporating plant for laboratory use, H. Raistrick and G. Smith (*Biochem. Jour., 27 (1933), No. 1, pp. 96–98, figs. 2*).—A large annular water bath surrounds a vertical central condenser to which six 5-l round flasks are connected through brass vapor tubes attachable to the condenser head by brass unions. A large receiver, containing a cooling coil through which the cooling water passes before entering the condenser proper, stands directly beneath the condenser and is connected therewith by means of a union, any strain upon which is prevented by the proper adjustment of leveling screws which form part of the water bath condenser combination. An annular shelf surrounds the water bath, providing support for a supply vessel for each flask, which can be refilled without disconnection merely by opening the glass stopcock in the supply connection dipping into the reservoir on the shelf and passing through the rubber stopper of the distilling flask. The apparatus is constructed mainly of heavily tinned copper and of brass. A rotary oil pump was found a satisfactory means for the required reduction of pressure. The note is illustrated with a photograph and a section drawing of the device.

Note on the technique for isolating bases by means of Reinecke's salt, H. W. Dudley (*Biochem. Jour., 27 (1933), No. 1, p. 157*).—From the dried reineckate precipitate (20 g) from an extract of 25 l of ox blood, dissolved in acetone and filtered to remove insoluble impurity, two picrates were isolated in small quantity, 2.22 g (*a*) and 0.5 g (*b*) respectively. These picrates could not be recognized as those of any known basic constituent of blood extracts. "Analyses of (*a*) and of the chloroaurate derived from it, and the physical properties of these salts, identified the base as 2:3:5:6-tetramethyl-

4-piperidone (triacetonamine), and (*b*) was similarly found to be β-amino isopropylacetone (diacetonamine) picrate. . . .

"Before concluding that these two substances actually occurred in small amounts in blood the suspicion arose that they might be artifacts, and so indeed they proved to be. This was demonstrated in two ways. Firstly, Reinecke's salt was dissolved in acetone, and by a procedure similar to that applied to the bases from the blood extract small amounts of diacetonamine and triacetonamine were subsequently isolated; and, secondly, a search for these bases in another blood extract by a technic which rendered their artificial production impossible was fruitless. It should be noted, therefore, that when ammonium reineckate is dissolved in acetone a reaction occurs between solvent and solute with the production of diacetonamine and triacetonamine. Consequently the purification of a reineckate precipitate containing ammonium reineckate, such as many extracts of biological origin will yield, by dissolution in acetone, will result in the production of the two artifacts which have been detected in the present instance. This complication, and the possibility of others of a similar nature, suggest that the use of acetone as a solvent for reineckate precipitates should be avoided when possible."

On the influence of different concentrations of NH_4Cl and NaCl on the determination of Ca and Mg from their chlorides [trans. title], E. N. NABILKOVA (*Trudy Pochven. Inst. Im. Dokuchaeva* [*Leningrad*] (*Trans. Dokuchaev Soil Inst.*), *8* (*1933*), *No. 8, pp. 43–51; Eng. abs., pp. 50, 51*).—Noting the frequent occurrence in soil analysis of considerable concentrations of ammonium and sodium chlorides in the solutions from which calcium and magnesium are precipitated, the author describes an investigation of the effects of these salts upon the precipitation of calcium oxalate and of magnesium phosphate, stating the following among his findings:

Concentrated solutions of either salt hindered the precipitation both of calcium oxalate and of magnesium phosphate, and, in both cases, tended to produce coarsely crystalline precipitates. In solutions of the same concentration, ammonium chloride produced a more coarsely crystalline precipitate than did the sodium salt.

Variations in the concentration of ammonium chloride were not found to affect the quantitative result in the case of the calcium determination, but in the case of the magnesium determination it was found that the ammonium chloride concentration should lie between 4.0 and 0.1 N. Variations in the sodium chloride concentration did not affect the quantitative result in the magnesium determination, but raised the calcium figure increasingly with increasing concentrations either of the sodium chloride or of the calcium.

"The results of the present work lead us to the suggestion that Ca and Mg may be determined by way of precipitation from NH_4Cl and NaCl soil extracts (absorbed bases), which greatly shortens the analytical procedure."

An experiment of applying the methods of electrofiltration, electrodialysis, and electrolysis to the analysis of soils, I [trans. title], I. N. ANTIPOV-KARATAEV (ANTIPOV-KARATAIEV) and K. N. KRASIKOV (*Trudy Pochven. Inst. Im. Dokuchaeva* [*Leningrad*] (*Trans. Dokuchaiev Soil Inst.*), *8* (*1933*), *No. 8, pp. 5–22, figs. 6; Eng. abs., pp. 21, 22*).—The method of electrofiltration—a perforated conic cathode being placed between the filter and the wall of the funnel and a coiled wire anode suspended in the supernatant liquid in the filter—was found to make possible the complete removal from the soil of the absorbed calcium and magnesium. The rate of the calcium extraction dropped off rather sharply; that of the removal of the magnesium, very gradually, with some degree of rise after the greater part of the calcium had been taken out. Magnesium, and also potassium and sodium, were extracted in

quantities much larger than those removed by the acetate method, the sodium and potassium, especially, being extracted in quantities so much greater than those removed by the acetate method (from two to three times as great) that it is felt that the excess extraction indicates a certain degree of decomposition of the soil mass.

Electrodialysis gave results, with respect to calcium and magnesium, similar to those obtained by the electrofiltration procedure. The quantities of the alkali metal cations removed led to the suspicion, in the case of this method also, that some decomposition of the soil mass had accompanied the absorbed base extraction.

The possibilities of both methods as applied to the study of the various forms of the soil phosphates are pointed out.

Micro-chemical soil tests in connection with vegetable crop production, J. B. Hester (*Virginia Truck Sta. Bul. 82 (1934), pp. 1119–1135*).—The bulletin reports the application of the microchemical methods described by Morgan in Connecticut [New Haven] Station Bulletin 333 (E.S.R., 67, p. 105) with the modification, also used by Morgan, that a solution of sodium acetate (in the case of the work here reported, 10 g of sodium hydroxide, 20 ml of glacial acetic acid, and distilled water to make 2 l; pH 4.8 to 5.0) was employed as soil extractant in place of the acetic acid extractant solution originally proposed. The testing for various elements of extracts thus obtained from soil submitted to the station for examination is described, together with some other microchemical tests also used. The pH values were determined either in the laboratory with an electrometric quinhydrone set-up, or in the field with indicators, following the preparation of an extract clarified by shaking with pure barium sulfate. The tests as used by this station for phosphorus, potassium, ammonia and nitrates, calcium, magnesium, aluminum, and other soil constituents are stated.

Directions for sampling and an example of the form in which it is requested by the station that information concerning the soil submitted for diagnosis be furnished are included.

Improved methods for the isolation of methionine and ergothioneine, N. W. Pirie (*Biochem. Jour., 27 (1933), No. 1, pp. 202–205*).—Methionine was isolated from an enzymic hydrolysate of caseinogen by precipitation with mercuric acetate and phosphotungstic acid (in one operation), followed by fractionation with alcohol and precipitation with mercuric chloride. The yield was 1.2 percent. Ergothioneine was prepared by means of its cuprous derivative from an aqueous extract of ergot. The yield was 0.18 percent.

The determination of inorganic iodine in desiccated thyroid gland, W. Lawson (*Biochem. Jour., 27 (1933), No. 1, pp. 112–115*).—The author finds that extraction of desiccated thyroid glands with water dissolves iodine compounds other than inorganic iodides, in quantities dependent on the degree of denaturation of the gland and of such magnitude that aqueous extraction is not a method suitable for use in the estimation of inorganic iodine. Exhaustive extraction with methyl or with ethyl alcohol removed only dialyzable iodine, however, together with a trace of iodine combined with fat; and a rapid method whereby inorganic iodides can be estimated in desiccated thyroid glands regardless of the method by which the glands were dried is described. The procedure consists essentially in extracting the iodine compounds to be determined by shaking the powdered material for a few hours with cold methyl alcohol and determining the iodine thus dissolved. A single extraction with cold methyl alcohol was found to dissolve out as large a proportion of the total iodine as an extraction with ethyl alcohol carried on for 16 hr. in a Soxhlet apparatus.

A correction for the juice sampling error that is due to water in field trash, H. F. Hadfield (*Hawaii. Planters' Rec., 38 (1934), No. 2, pp. 155–156*).—Field trash accompanying flumed cane amounted, in several tests, to from 8.85 to 14.9 percent, and introduced flume water to an extent such as to cause a dilution of from 8.03 to 18.83 percent. The presence of the trash also introduced nonsugar solids of appreciable amount into the juice. The methods for correcting the control determinations made on the first expressed juice are discussed.

Manufacturing qualities of P.O.J. 2878, H. F. Hadfield (*Hawaii. Planters' Rec., 38 (1934), No. 2, pp. 126–130*).—Applying lime in part before and the rest after heating helped in the settling of juices, but the volume of settlings was such that the juice from the lower valve of the settling tank was never clear. Adding double superphosphate to the limed juice also improved the settling of the juice and gave a lighter color than did the divided application of lime. The volume of settlings, however, was the same.

"The addition of bagasse screenings to the juice in the settlers was not beneficial from the clarification standpoint. Fine bagasse added to the settlings just prior to filtration materially reduced pol in cake. When P.O.J. 2878 was crushed alone, the juice required, after liming and heating in the ordinary way, over 1 hr. to clarify to a very poor turbidity of 1.5 cm. When P.O.J. 2878 is mixed with other canes such as Yellow Caledonia and P.O.J. 36 in the proportion of 25 to 30 percent, clarification is just as good as that of Yellow Caledonia or P.O.J. 36 alone. The presses, however, do not function as well, and though the press cake is fairly firm the pol is usually higher."

AGRICULTURAL METEOROLOGY

Data on the drought (*Science, 80 (1934), No. 2069, p. 179*).—It is stated that "never before in the weather history of the United States has so little rain fallen over so wide a territory throughout the entire growing season" as during the present season. Normal and above-normal rainfall, January to July, was recorded only in the following States: Florida, 126 percent; Georgia, 101 percent; New England, 104 percent; North Carolina, 105 percent; and Virginia, 101 percent. Four other States—Alabama, 99 percent; South Carolina, 97 percent; and Maryland and Delaware, 96 percent—lacked but little of having normal rainfall. "The scanty snowfall in the western mountains last winter has aggravated drought conditions in those sections by cutting down the irrigation water supply."

A surprising decrease in rainfall at the critical period for corn, A. D. Ross (*U.S. Mo. Weather Rev., 62 (1934), No. 3, pp. 89, 90*).—Data are reported which show that "at 23 of the 32 first-order stations of the Weather Bureau in the corn-producing area of eastern Kansas and Nebraska, Iowa, Missouri, Illinois, Indiana, Kentucky, and western Ohio, there is a period from July 16 to 29, when the average precipitation drops below that of either the 14 days preceding or the 14 days following." This is a critical period for corn and the amount of rainfall during this period determines to a great extent the resulting yield.

Proceedings of the Western Interstate Snow Survey Conference (*Nevada Sta., 1934, pp. 82, figs. 21*).—This and a supplementary conference were held in 1933 at the Nevada Experiment Station, where the foundations and the beginnings of systematic and accurate snow survey and forecasting of water supply from snow cover were laid through the pioneer work of J. E. Church on Mount Rose. This early work has had wide recognition and application.

As Dr. Church states in his historical review, snow surveying "has become a division of State government in Nevada, California, Utah, and Oregon. It is widely practiced in Washington, Idaho, and Canada. It has become a State-wide cooperative system in New York. A committee on the hydrology of snow has recently been organized by the National Research Council to bring all snow surveying efforts together in common acquaintance and with a common standard and increased energy. The new science has even become *international and will inevitably seek international organization.*"

The more formal subjects discussed at the conference included The Biography of Snow Surveying, by J. E. Church; Progress and Conduct of California Cooperative Snow Surveys, by H. M. Stafford; Equipment, by S. M. Munson, G. D. Clyde, and F. O. Herz; Relation of Forests to Snow, by J. Kittredge, Jr.; Considerations in Measurement of Yield of Snow Packs in Percolation Water, by W. C. Lowdermilk; The Long-Term Trend of Rainfall in the Central Sierra Region, by G. V. Sager; Normals on the Eastern Slope of the Central Sierra Nevada, by H. P. Boardman; and Effect of Temperature, by G. D. Clyde and J. E. Church.

Monthly Weather Review, [March–April 1934] (*U.S. Mo. Weather Rev., 62 (1934), Nos. 3, pp. 77–113, pls. 12, fig. 1; 4, pp. 115–148, pls. 12, figs. 7*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 3.—Compilation and Summary of the Evaporation Records of the Bureau of Plant Industry, U.S. Department of Agriculture, 1921–32, by R. E. Horton and J. S. Cole (pp. 77–89); A Surprising Decrease in Rainfall at the Critical Period for Corn, by A. D. Robb (pp. 89, 90) (see p. 745); Analyses of the Precipitations at Mount Vernon, Iowa, for 1932–33, by L. Hines (pp. 90, 91): Excessive Rain and Flood in the Los Angeles, Calif., Area, by L. H. Daingerfield (pp. 91–94): Meteorological Conditions Attending the Heavy Rainfall in the Los Angeles, Calif., Area, December 30, 1933, to January 1, 1934, Inclusive, by G. M. French (pp. 94–96); The New Orleans, La., Tornado of March 26, 1934, by G. Norton (pp. 96, 97); Rime Caps and Snow Cocks (p. 97); and Sleet and Ice Storm in Tennessee on March 19, 1934, by R. M. Williamson (pp. 97, 98).

No. 4.—Recent Advances in Anemometry, by C. F. Marvin (pp. 115–120); Special Series of Sounding-Balloon Observations Made during the Winter of 1929–30, by L. T. Samuels (pp. 121–128); Snow-Surface Temperature, by R. E. Horton and H. R. Leach (pp. 128–130); Temperature Relations between the Two Chicago, Ill., Weather Bureau Stations: Campus of the University of Chicago and the Roof of the United States Courthouse, by C. A. Donnel (pp. 131, 132); Meteorological Conditions and Wheat Yields in Ford County, Kans., by C. E. Koeppe (pp. 132, 133); Central Office of United States Weather Bureau Struck by Lightning, by A. K. Showalter (p. 133); and The "Sinking" of Lake and River Ice, by W. J. Humphreys (pp. 133, 134).

SOILS—FERTILIZERS

[Soil work of the Texas Station] (*Texas Sta. Rpt. 1933, pp. 17, 18, 161*).—Soil fertility factors and soil analyses are reported upon by G. S. Fraps; nitrification by Fraps and A. J. Sterges; and soil moisture determinations on Houston eroded clay and Houston black clay by H. Dunlavy.

The problems of agricultural physics, I, II [trans. title], P. I. Andrianov (P. J. Andrianow) (*Trudy Tsent. Nauch. Issledov. Inst. Sakh. Promysh.*

(*TSINS*) [*Moskva*] (*Trans. Cent. Sci. Res. Inst. Sugar Indus.*), *No. 8* (*1932*), *pp. 5–15; Eng. abs., p. 15; pp. 15–23, fig. 1; Eng. abs., p. 23*).—The first paper (the physical properties of the soils) presents the author's view that the physical properties of the soil are a function of the degree of its dispersion and, accordingly, of the specific surface of the soil mass. He, therefore, divides the physical properties of the soil into groups according to the various "elements" of the soil mass—"from the properties of the electrons, molecules, and so on, to the properties of the solid body." The author regards a study of the total surface of the soil particles and of the temperature of the soil mass as a necessary part of an agricultural investigation of the soil.

In the second paper (the constitution, structure, and the stability of the structure of the soil, and the estimation of the work of plowing implements) the conclusions reached are, in part, that the constitution and structure of the soil mass must be characterized as space phenomena by corresponding units of measure; the space occupied by unit volume to be the measure of the compaction of the soil mass, the unit volume being the volume of specific gravity in grams. "The specific surface S_d, or total surface of soil particles of soil mass in the volume unit, is the measure of the dispersion of the soil mass. Stability of the structure of soil mass must be characterized by *erg/cm*² which is required for the destruction of the structure of the soil. The stability of the constitution of soil depends on the stability of its structure. The stability of structure and constitution of soil are the result of cohesion, which depends on the surface contacts between soil particles and on cementing action or adhesion of the unfree water. The cohesion and adhesion, and consequently the stability of the structure of soil, must be characterized by mechanical equivalent of heat of wetting of the soil $E(r_s+i)=R$ *erg/cm*², which is the potential stability of structure of the soil mass. The potential stability of soil more or less saturated with monovalent cations, such as Na, is manifested only in dry conditions."

The comparative effect of the different plowing implements on the structure and constitution of soil must be determined by the characteristics of specific surface S_d,—by the volume unit of soil mass V_d, by potential stability of structure R, and by determination of the exchangeable bases.

The heat of wetting of soil [trans. title], G. K. Davydov (Davidoff) (*Trudy Tsent. Nauch. Issledov. Inst. Sakh. Promysh.* (*TSINS*) [*Moskva*] (*Trans. Cent. Sci. Res. Inst. Sugar Indus.*), *No. 8* (*1932*), *pp. 24–32, fig. 1; Eng. abs., p. 32*).—The heat effect of the dilution of the soil salts was found to be so slight as to be without effect upon the results of the heat of wetting measurements. The heat of wetting of the soils was observed to depend on the exchangeable bases, the heat of wetting of the soil saturated with Ca being greater than that of a soil saturated with H, and the heat of wetting of the soil saturated with H greater than that of soil saturated with Na. The total surface of the soil saturated with Ca was found less than that of soil saturated with H, and the total surface of soil saturated with H less than that of soil saturated with Na. The surface tension of the adsorbed water calculated from the equation of heat of wetting of the soils investigated varied with the total surface. The calculation of the total surface of soils from the quantity of soil colloids gives the same order, Ca<H<Na, as that obtained from the equation of heat of wetting of soils.

Contribution to the study of the absorption capacity of soils [trans. title], E. N. Ivanova (*Trudy Pochven. Inst. Im. Dokuchaeva* [*Leningrad*] (*Trans. Dokuchaiev Soil Inst.*), *8* (*1933*), *No. 8, pp. 23–41, fig. 1; Eng. abs., pp. 40, 41*).—The quantity of the replacing base remaining the same, the capacity of a given soil for the physicochemical absorption of the base was found to decrease

with increasing dilution of the replacing salt, though not in proportion to the extent of the dilution. It was further found that the lower was the absolute quantity of the replacing base, the more rapidly did the replacement rate fall off with the dilution of the solution.

With respect to mixtures of replacing cations, it was found that the presence of the calcium ion markedly lowered the rate of absorption of the sodium ion. The relative effect of the calcium remained constant at different total concentrations when the calcium : sodium ratio was kept constant. It is noted, however, that "calcium carbonate, owing to its low dissolution in sodium chloride and, on the other hand, to its instability in the dissolved state, hinders but little the absorption of sodium from solutions. Therefore in natural conditions likewise the presence of carbonates in soils does not always protect soils from the entering of sodium into the absorbing complex, and we often meet with carbonatic solonetzs."

On the influence of the replaceable bases on the physicomechanical properties of soils.—I, The influence of the absorbed sodium [trans. title], A. M. Pankov (*Trudy Pochven. Inst. Im. Dokuchaeva* [*Leningrad*] (*Trans. Dokuchaiev Soil Inst.*), *8* (*1933*), *No. 2, pp. 27, figs. 10; Eng. abs., pp. 26, 27*).—The author treated samples of an argillaceous, thick chernozem soil rich in humus with sodium carbonate in quantities equivalent to from one-tenth of the base-exchange capacity to the total base-exchange capacity of the soils, leaving the samples to settle and dry in the beakers in which they were treated. The morphology of the dried cylinders was observed and photographed, and the physical properties of the treated soils were measured.

All the physical properties examined appeared to be distinctly dependent upon the proportion of sodium absorbed. Properties especially affected by the sodium content of the exchange complex were the hygroscopicity, nearly doubled by 0.9 sodium saturation; water capacity, increased nearly 4 times by complete sodium saturation; absolute cohesion, increased by from 5 to 6 times; water soluble humus, increased by 80 times after complete replacement of the exchangeable bases with sodium; etc.

Oats sown on these sodium-treated soils made the best growth on the soil three-tenths of the base-exchange capacity of which had been saturated with sodium.

Soils in relation to fruit growing in New York.—IV, The significance of the oxidation-reduction potential in evaluating soils for orchard purposes, R. Bradfield, L. P. Batjer, and J. Oskamp ([*New York*] *Cornell Sta. Bul. 592* (*1934*), *pp. 27, figs. 8*).—The authors have continued orchard soil drainage studies previously reported (E.S.R., 70, p. 47), finding that an inadequacy of subsoil drainage not marked enough to be detected by field examination of the soil profile lowered the oxidation-reduction potential to an extent such that E_h measurements (preferably made in such acid media as 0.1 N sulfuric acid, in which the potential was more stable than in less acid media) could be used as an index of the subsoil drainage conditions.

"The oxidation-reduction potential of the soils studied was found to be lowest early in the spring. It seems to increase as the ground water is lowered, and reaches a maximum in late summer. There is considerable lag between the retreat of the ground water from a subsoil horizon and the establishment of the maximum redox potential in it. For this reason, a measurement of this potential promises to be a useful index of subsoil drainage conditions over a longer period than are ground-water observations. It seems likely also that the harmful influence of the poor drainage conditions in the soil is due not so

much to the direct effect of the excess water but to the deficiency of air and the changes which take place as a result of such deficiency."

With respect to the orchard soil conditions from early spring until midsummer, "the maximum difference between them [soils from under groups of high- and low-producing trees] occurred in early spring. In one orchard the differences practically disappeared by the first of July; in the other, significant differences still existed at that time. From the limited amount of data available, it would seem that April and May are the best months for detecting these differences in soils. It was found possible, in the orchards studied, to eliminate from 80 to 90 percent of the poor sites on the basis of their redox potential in the early spring months."

Plant association and survival, and the build-up of moisture in semiarid soils, J. F. Breazeale and F. J. Crider (*Arizona Sta. Tech. Bul. 53 (1934), pp. 95–123, figs. 15*).—The authors found "(1) that roots of certain plants are able to penetrate soils that are below the wilting point. (2) That plants are able to absorb moisture from one soil horizon, where it is available, and to transport this moisture and exude it into another soil horizon where it is scarce. (3) That a certain amount of dependence of one plant upon another may exist in nature in relation to their moisture supply. A deep-rooted plant may absorb moisture from the subsoil, transport this, and exude it into the surface soil where a shallow-rooted plant may absorb it and thus tide over periods of stress. (4) That certain dry-land plants can endure drought as long as they are able to exude water which has been stored up in their tissues, and thus maintain the soil in close contact with their roots at the wilting percentage."

On the weathering of the feldspars in connection with soil formation [trans. title], P. A. Zemíătchenskiĭ (Zemiatchensky) (*Trudy Pochven. Inst. Im. Dokuchaeva [Leningrad] (Trans. Dokuchaiev Soil Inst.), 8 (1933), No. 1, pp. 42; Eng. abs., pp. 40–42*).—The author emphasizes the necessity for taking account of a representative variety of climatic conditions in studies of weathering and soil formation, specifying eight variations of temperature and moisture relations, of which five are represented in Russia. The present paper is concerned with the weathering process as observed under conditions of abundant moisture and low temperature, the soil material examined having been that of northwestern Russia and the Murman Coast.

"In the climatic conditions not only of the Baltic Sea region but also beyond the Arctic Circle, in the region of the Murman Coast the weathering process consists in the physical disintegration of rocks and minerals, as well as in the chemical influence of the constituting parts of the atmosphere and in the biochemical processes, depending on the presence of plant and animal life of the region."

Atmospheric influences were found to convert feldspars into a mineral similar to muscovite but of a much larger water content, so that "the product of weathering of the feldspars in this region may be called hydromica." The formation of this micaceous mineral is considered to begin with an absorption of water by the feldspars. Hydrolysis follows, then absorption of carbon dioxide and the formation of carbonates of the alkali metals. These carbonates are believed to dissolve and remove a part of the silica set free in the initial hydrolysis, and "there remains a compound more stable with regard to hydrolitic decomposition, and in which the ratio $Al_2O_3 : SiO_2$ is equal, or nearly equal to 2. CaO and partly the alkalies (mostly Na_2O) are leached, however a part of these (chiefly K_2O) remains, after more strongly combining with the group $Al_2O_3.2SiO_2$." The micaceous product, very resistant to further weathering, was found, with undecomposed minerals, in local lake and river sediments.

Effect of frequent fires on chemical composition of forest soils in the longleaf pine region, F. Heyward and R. M. Barnette (*Florida Sta. Bul. 265 (1934), pp. 39, figs. 16*).—In determinations of total nitrogen, loss on ignition, replaceable calcium, and acidity in representative pine forest soils in the longleaf pine region subjected to annual fires, and on comparable adjacent soils protected from fire, the soils subjected to frequent fires were found to be consistently less acid, and to have higher percentages of replaceable calcium and total nitrogen. Loss on ignition indicated that these burned soils also contained larger quantities of organic matter. Soils from burned areas showed pH values ranging from 0.15 to 0.48 unit higher than those of unburned areas, and as much as 101 percent more of replaceable calcium was found in burned soils as in the corresponding unburned soils. Differences in total nitrogen were "small but significant, ranging up to 14 percent in favor of soils subjected to fire." The observed changes in chemical composition of the soils, ascribable to fire, were restricted to the top 4 to 6 in.

Unburned areas studied had a layer of pine needle litter from 2 to 3 in. deep. Except in openings in the stands of pine, only a scant ground cover was present. On the frequently burned areas only a small quatity of litter was present, but a ground cover, consisting of wire grass and a wide variety of broad-leaved herbaceous plants, including numerous members of the Leguminosae was typical.

"Differences . . . in nitrogen and organic matter are believed to be due to differences in the forest floor and in ground cover as a result of burning. Changes in acidity and in replaceable calcium can be attributed to the addition of ash following fire."

Soil survey (reconnaissance) of the trans-Pecos area, Texas, W. T. Carter et al. (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1928, No. 35, pp. 66, pls. 12, figs. 5, map 1*).—The area surveyed (with the cooperation of the Texas Experiment Station) consists of 20,090,880 acres in the 9 counties of western Texas which lie west of the Pecos River; comprises plateaus, more or less mountainous ridges, and lowland basins; and in certain parts has an underdrainage not adequate to prevent the accumulation of alkali salts under irrigation.

Rough stony land and rough broken land take up 28.5 percent of the area, the largest classified type being Reeves gravelly loam, of which 10 percent was found. In all, 9 series consisting of 22 types were recognized.

[Soil Survey Reports, 1929 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 24, pp. 34, pls. 2, figs. 2, map 1; 25, pp. 38, figs. 2, map 1; 27, pp. 28, pls. 2, figs. 2, map 1; 28, pp. 55, pl. 1, figs. 3, map 1; 29, pp. 39, figs. 2, map 1*).—The five soil surveys here noted were carried out with the cooperation of the corresponding State experiment station.

No. 24. *Soil survey of Hennepin County, Minnesota*, P. R. McMiller et al.—Hennepin County contains 361,600 acres in southeastern Minnesota, this area including smooth plain, hilly belt, and undulating plain sections, all drained by the Mississippi River.

The soils were found to constitute 13 types, here grouped into 8 series. Hayden loam, 26 percent of the soil area of the county, is the most extensive, Clarion loam following with 11.8 percent. Of the deeper peats 14 percent was found, and of peat shallow phase (less than 2 ft. thick) 1.2 percent.

No. 25. *Soil survey of Frio County, Texas*, M. W. Beck et al.—Frio County consists of 719,360 acres in southern Texas. "Much of the surface is nearly flat or gently undulating, with many low hills and ridges having long smooth

gentle slopes. . . . The streams . . ., most of which are intermittent, occupy shallow channels lying within narrow flat strips of flood plain."

Twenty-one soil types and 9 phases of types representing 18 soil series are mapped. The most extensive of these is Duval fine sandy loam, which forms 19.1 percent of the county.

No. 27. *Soil survey of St. Clair County, Michigan*, E. B. Deeter et al.—St. Clair County has an area of 464,640 acres and is located in the southeastern part of the Lower Peninsula of Michigan. Its soils lie mainly upon a smooth glacial plain sloping gently from north to south. The drainage system includes the Black, Belle, Pine, and St. Clair Rivers and minor streams.

Of 31 series, inclusive of 38 types, the most extensive individual soils are Conover silt loam, which covers 19.7 percent of the area surveyed, and Nappanee silt loam, which occupies 10.3 percent.

No. 28. *Soil survey (reconnaissance) of the Columbia Basin area, Washington*, A. T. Strahorn et al.—The Columbia Basin area, 3,084,160 acres in southeastern Washington, includes the entire area of Franklin County and parts of Grant, Adams, Lincoln, and Walla Walla counties. The area is in general a smooth westward-sloping plain, deeply but incompletely dissected and entirely within the drainage basin of the Columbia River. The soils are mapped and described as 16 series, inclusive of 15 definite types and 6 undifferentiated composites, each comprising soils of 2 series and of 1 or more texture types. Of the Wheeler loams, including a hardpan phase, 23.1 percent was found; of peat and muck, rough broken, stony, and scab lands, and dune sand taken together, 16 percent; and of Ephrata sandy loams, 11.9 percent.

No. 29. *Soil survey of Poweshiek County, Iowa*, T. H. Benton and A. E. Shearin.— Poweshiek County, southeastern Iowa, has an area of 373,120 acres of a smooth plain dissected in a few small areas by streams. "The tributaries of the streams subdivide and penetrate all parts of the county, except comparatively narrow flat interstream divides."

Tama silt loam, the most extensive of the 17 types here listed in 13 series, occupies 52.6 percent of the area.

[Soil Survey Reports, 1930 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 14, pp. 47, figs. 2, maps 2; 16, pp. 33, figs. 2, map 1*).—The two surveys here noted were made with the cooperation of the following State agencies, respectively: West Virginia Geological Survey and the West Virginia Experiment Station and the University of Nebraska State Soil Survey.

No. 14. *Soil survey of Hardy and Pendleton Counties, West Virginia*, B. H. Williams and H. M. Fridley.—The two counties surveyed form an area of 821,120 acres in the Appalachian Mountain region in eastern West Virginia. The greater part of the drainage of the area is provided by the South Branch Potomac River. Dekalb shaly silt loam, 11.3 percent of the area examined, is the most extensive of the 28 types here classified as 16 series. Rough stony land occupies 29.5 percent of the aggregate area of the two counties.

No. 16. *Soil survey of Furnas County, Nebraska*, L. A. Brown and S. R. Bacon.—Furnas County, Nebraska, lies in the southern part of the State, occupies 458,240 acres, and possesses widely varying topographic features. The county is well drained except in small areas of alluvial land. Colby silt loam and Holdrege silt loam, 40.7 and 36.5 percent, respectively, of the total lands examined, are the most extensive and important of the 16 types and 10 series recognized.

On the soils of the Adzharia coast of the Black Sea [trans. title], B. B. Polynov, V. V. Romanov, and O. A. Grabovskaiâ (Grabovskaya). (From

Pochven. Inst. Im. Dokuchaeva [*Leningrad*] (*Trans. Dokuchaiev Soil Inst.*), *8* (*1933*), *No. 4, pp. 38, fig. 1; Eng. abs., pp. 37, 38*).—"The characteristic peculiarity of weathering on the Batum coast is the complete preservation of the structure of the primary rock, i.e., the space occupied by the mineral in the unweathered rock is later on filled by the products of its decomposition, without changing its outlines. This creates a great variety of coloring of the weathering crust, for the different minerals give differently colored products of weathering." Weathering, under the prevailing conditions of the Batum coast, described as possessing a moist, warm climate, is found to proceed rapidly, its first stages taking place under alkaline conditions and acidity conditions developing in later phases of the process. Silica and bases were found to be removed rapidly under these conditions, "so that the final products of weathering are greatly enriched by sesquioxides and somewhat less by manganese." Other observations and conclusions are also recorded.

The soils of the Pechora region [trans. title], Ѳ. A. Livbrovskiĭ (G. A. Liverovsky) (*Trudy Pochven. Inst. Im. Dokuchaeva* [*Leningrad*] (*Trans. Dokuchaiev Soil Inst.*), *8* (*1933*), *No. 7, pp. 47, figs. 14; Eng. abs., pp. 43–47*).—The author records the findings of a soil survey covering a large area, including the three geomorphological divisions: (1) The area of the western Ural foothills, (2) the Pechora lowland, and (3) the part of the Timan range belonging to the Pechora Basin. The nature, degree of development, chemical condition, etc., of the soils as found in each of several zones are described.

On the chemical composition of mechanical fractions of some podsol and bog soils [trans. title], A. A. Rode (*Trudy Pochven. Inst. Im. Dokuchaeva* [*Leningrad*] (*Trans. Dokuchaiev Soil Inst.*), *8* (*1933*), *No. 3, pp. 56; Eng. abs., pp. 55, 56*).—The author describes the podsolization process as consisting of two stages, in the first of which primary soil minerals undergo a decomposition and the decomposition products recombine to produce secondary minerals containing a greater proportion of the sesquioxides and of magnesium and potassium than did the primary material. The second stage is here described as a decomposition of the secondary minerals and of the remaining primary material, in which "the bulk of the decomposition products is being removed and only silica, in the form of primary quartz, accumulates (relatively)." The first of these processes was found to occur predominantly in the B horizon, the second predominantly in the A horizon. It is considered, further, that the B horizon is not merely an alluvial region but may be even more a region of transformations.

The A horizon of podsol soils which had not been swamped was found to show an almost complete decomposition of the mineral colloidal components. The A horizon as observed on the podsol bog soils, in addition to an increased humus content, "contains mineral colloids probably as secondary products of the podsol formation process."

The gley formation process, which was found to bring about a rapid decomposition of the primary minerals, was also studied in some detail.

Magnesium, calcium, and iron requirements for growth of Azotobacter in free and fixed nitrogen, C. K. Horner and D. Burk (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 11, pp. 981–995, figs. 2*).—Quantitative determinations, in culture experiments of a duration of from 2 to 10 days, of the magnesium, calcium, and iron concentrations required for the growth of *A. vinelandii* in the presence both of free nitrogen and of combined nitrogen in various forms were made, together with less elaborate trials of the effects of some other inorganic elements. Growths of from 20 to 200 mg of dry matter per 100 cc were obtained.

"The concentrations of the respective elements yielding half maximum growth ($C_{G/2}$) have been determined as the most accurate means of making various comparisons. In these experiments $C_{G/2}$ was relatively independent of duration of experiment and extent of growth. $C_{G/2}$ for Ca is $2\text{–}5\times10^{-3}$ millimolal in free nitrogen, and negligible ($0\text{–}2\times10^{-4}$ millimolal) in fixed nitrogen, such as nitrate, ammonia, or urea; this difference confirms previous findings concerning the specific role of calcium in the nitrogen-fixing process. With Mg and Fe, $C_{G/2}$ is independent of the source of nitrogen, being $2\text{–}6\times10^{-3}$ and $1.1\text{–}1.6\times10^{-4}$ millimolal, respectively. The essential role of both Mg and Fe in growth is indicated by an approach to zero growth at the lowest concentrations. No specific requirement of Fe (or Mg) in fixation was evident in experiments of the type here employed, confirming previous findings that normally humate iron exerts the same stimulation in free and fixed nitrogen.

"The concentrations of Mg, Ca (in free nitrogen), and Fe required for maximum growth are 0.05–0.1 millimolal, 0.1–0.3 millimolal, and 0.0004–0.001 millimolal, respectively. The requirement for P appears to be 0.1 millimolal, and for S, K, Mo, and V equal to or less than that for Fe. Mg could not be replaced in the growth process by Cu, Mn, Ni, Co, Al, Zn, Ca, Sr, Ba, Mo, Si, Ti, Cr, V, B, or Li applied in various concentrations.

"In ascertaining the very low Fe requirement, adsorption methods involving charcoal, calcium carbonate, or calcium phosphate did not suffice to free the medium from iron. It was necessary to select sugars with different and very low amounts of iron. This method should be useful in connection with various elements similarly needed in traces in general bacterial growth."

The distribution and condition of nitrogen in three horizons of a differentially fertilized Hagerstown clay loam soil planted to apple trees in metal cylinders, W. Thomas (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 9*, *pp. 845–856*).—The author reports, in a contribution from the Pennsylvania Experiment Station, upon the distribution of total nitrogen, and also of the nitric and nonnitric fractions in the three horizons, 0–7 in., 7–21 in., and 21–53 in., of a Hagerstown clay loam soil contained in cylinders planted to apple trees and treated with different combinations of sodium nitrate, monocalcium phosphate, and potassium sulfate.

"In all treatments the total nitrogen of the surface soil under sod was somewhat greater than under cultivation. In the subsurface the differences in total nitrogen were small except in the check cylinders under sod, in which it was less than under tillage. In all treatments the total nitrogen of the subsoil was greater in the cylinders under cultivation than in the corresponding cylinders under sod. For the whole depth (0 to 53 in.), the total nitrogen at the end of the experiment was greater in all cylinders under cultivation than in those under sod. The disappearance of nitrogen (as total nitrogen) by leaching, and possibly as gaseous nitrogen, was greater under sod than under cultivation in all cases."

In a discussion of the movement of nitric nitrogen "it is concluded that leaching of nitrates from this heavy soil was not very rapid. The disappearance of nitric nitrogen, when account has been taken of the nitric nitrogen absorbed by the trees equivalent to that added as $NaNO_3$, was greater in all nitrated cylinders under cultivation than in corresponding cylinders under sod. This difference is accounted for by an accretion of nitrogen as nonnitric nitrogen in the subsoil under cultivation but not in that under sod. Results with respect to nitrogen gains or losses based on the soil to a depth of 53 in. are very different from those based on the 0- to 7-in. or 0- to 21-in. depths."

Laboratory and greenhouse studies of rice nutrition, L. C. Kapp (*Arkansas Sta. Bul. 302 (1934), pp. 32*).—In studies with Crowley and Clarksville silt loam soils, "the results indicate that the lack of a sufficient supply of available nitrogen in the rice soil is one factor that is responsible for the low yield of rice. Data show that drying the soil and avoiding the addition of large amounts of carbonaceous materials prior to planting rice will keep the supply of available nitrogen at a level which will insure a greater yield. This suggests a possible rotation of crops, including a legume which may be satisfactorily used where conditions permit." Fertilizers supplying potassium and phosphorus in some cases increased the content of these elements in the rice, but did not effect any increase in yield.

On the absorption of phosphate by plants from soils of which the exchange complex has been saturated with various cations [trans. title], **G. K. Davydov (Dawidow)** (*Trudy T͡sent. Nauch. Issledov. Inst. Sakh. Promysh. (T͡SINS) [Moskva] (Trans. Cent. Sci. Res. Inst. Sugar Indus.), No. 8 (1932), pp. 33–42, figs. 6; Ger. abs., pp. 41, 42*).—The author replaced other cations in portions of a normal chernozem soil with calcium, sodium, and hydrogen, respectively, by leaching the soil with solutions of the chlorides of the elements named, the two soils being applied in 0.1 N solution, the acid in 0.05 N solution. The phosphate was in each case added in the form of the phosphate of the element with which the exchange complex had been saturated, and in quantities amounting to 0.01 and 0.1 percent of the weight of the soil. Oats were used as test plants, and the growth experiment was carried out in a manner similar to that of a Neubauer test (E.S.R., 50, p. 118; 53, p. 319).

Calcium saturation of the soil favored plant phosphate absorption. Saturation of the exchange complex either with sodium or with hydrogen greatly depressed the growth of the plants and markedly lessened their phosphate absorption capacity. The plants absorbed a significantly greater quantity of phosphate when the solution of the higher concentration was applied.

On the capacity of plants to utilize difficultly soluble calcium phosphates [trans. title], **V. V. Butkevich (W. W. Butkewitsch)** (*Trudy T͡sent. Nauch. Issledov. Inst. Sakh. Promysh. (T͡SINS) [Moskva] (Trans. Cent. Sci. Res. Inst. Sugar Indus.), No. 8 (1932), pp. 61–99, figs. 8; Ger. abs., pp. 97–99*).—The author presents the more or less detailed theoretical analysis of the various factors postulated by him as those controlling the capacity of plants to affect the solution of water-insoluble phosphates in the root zone and to utilize phosphorus and calcium thus brought into solution; and reports experiments which showed the plants studied to have the power of absorbing phosphates from solutions of low concentration, diminishing in the following order: Potatoes, maize, peas, barley, oats, beets, wheat, buckwheat, millet, mustard, flax, and lupine. With reference to capacity to utilize the phosphorus taken up, the author lists the experimental plants in the diminishing order, flax, maize, beets, lupines, vetch, mustard, barley, peas, wheat, buckwheat, oats, and potatoes. As the result of solution culture experiments, as well as on the basis of the theoretical considerations elaborated, the following series was established as representing, in order of greatest to least, the capacity of the experimental plants to affect the solution of water-insoluble phosphates: Lupines, mustard, buckwheat, peas, maize, vetch, millet, barley, and oats.

Phosphate fixation in Hawaiian soils, I, II (*Hawaii. Planters' Rec., 37 (1933), No. 4, pp. 182–196; 38 (1934), No. 2, pp. 131–145, figs. 3*).—In part 1 the author, F. E. Hance, finds not only that heavy phosphate fixation may be expected in a highly colloidal soil, but that soluble phosphates may be pre-

cipitated in a sandy or other soil in an insoluble form. "In such a case the phosphate may or may not be rendered difficult for the plant to absorb. Soil particle size, total soil areas exposed to action of soil solution, and ratio of colloids to noncolloids in any soil are factors of importance in the phenomenon of phosphate fixation."

Other conclusions are in part, "that even after applied soluble phosphate has become fixed in the soil and the plant absorbs the available supply in the soil water solution, additional phosphates redissolve from the fixed reserve and enter the soil solution again. The process appears to be continuous, and in the absence of removal by leaching, or by the plant, the action will continue until a balance has been established between the phosphate in the soil solution and that residing in the fixed reserve. When the rate of transfer is below the requirements of the plant (as it is in many cases), then phosphate starvation occurs. In many respects moderate fixation of phosphates by the soil is of distinct advantage to the crop and grower. The problem of excessive leaching is absent—in some cases the phosphate nutrient may pass into the soil solution in continuous and progressive amounts as it may be needed. The fixed phosphate may thus function as a nearby reserve immune from leaching or other loss. . . .

"In many soils phosphate fixation is severe enough to result in deficient nutrition when fertilizer applications of 100 to 200 lb. of phosphoric acid, as soluble phosphate, are made, but if the degree of fixation is not too great, larger but moderate applications such as 300 to 500 lb. may be sufficient to support good growth. In soils which have very high fixing power, it is possible that phosphate applied as an insoluble compound may be sufficiently available and yet not be fixed by the soil. We believe that possibly fertilizer briquettes will constitute a very useful means of applying insoluble phosphates in conjunction with other nutrients. As a rule subsoils show a higher fixing ability than the corresponding surface soils. Disregarding convenience and economy, it has been found that molasses and/or soluble silica are effective in reducing the phosphate fixing capacity of soils. The larger the application of soluble phosphate to a given soil, the greater is the proportion thereof which remains in water-soluble, and hence available, form."

With the purpose of comparing the phosphate fixing power of widely differing soils, the author of part 2, A. Ayres, extracted air-dried soil samples with a solution of diammonium phosphate and ammonium chloride and determined the phosphate fixation effected by the soil sample by an analysis of the filtrate. Three soils of very distinct chemical properties having been chosen, "from 10-12 extractions were made in the case of each of these soils, the period thereof varying from 5 min. to 48 hr. A soil-solution ratio of 1:10 was used, soil and phosphate solution being employed in amounts of 50 g and 500 mg, respectively. This corresponds to a treatment of 25,000 lb. P_2O_5 per acre-foot of soil. While it may appear unreasonable to treat soils with phosphate in such large amount, even in the laboratory, it becomes necessary for the satisfactory study of our highest-fixing soils."

The rates at which typical Hawaiian soils fixed phosphate under these conditions having been determined, "when soils were treated with solutions of phosphate and subjected to continuous mechanical agitation, fixation was found to occur at a tremendous rate during the first hour. Subsequently it diminished, becoming very low and constant in about 12 hr. and continuing thus for the balance of the 48-hour period during which the test was conducted. The higher fixing soils were found to absorb phosphates more rapidly than the lower fixing soils. The rate at which fixation occurs was found to depend

upon the relative quantities of soil and phosphate reacting. This suggests that fixation under field conditions may be effectively retarded by applying the phosphate in limited zones accessible to the cane roots. Excepting the soils of the Hilo coast, a general correlation was found to exist between the degree to which fixation occurs in soils and the availability therein of applied soluble phosphate."

Testing soil for available phosphorus, C. M. Linsley (*Illinois Sta. Circ. 421 (1934), pp. 4, fig. 1*).—This circular points out the need for a phosphorus availability test, and gives brief nontechnical directions for carrying out the field test devised by Bray (E.S.R., 62, p. 13). A color chart of four degrees is included.

The effect of potassium deficiency on the composition of the tomato plant, T. G. Phillips, T. O. Smith, and R. B. Dearborn (*New Hampshire Sta. Tech. Bul. 59 (1934), pp. 16*).—The authors point out that "plants suffering from extreme potassium deficiency are so stunted and abnormal that a comparison of them with normal plants is difficult and may be misleading"; and consider, therefore, "that the primary effects of potassium would be shown more clearly by differences in composition which occur as soon as potassium deficiency can be recognized. Plants nearly as large and vigorous as the control plants on full nutrient solution would be the basis of this comparison, rather than abnormal ones resulting from long continued and severe deficiency."

In accordance with this improved method of experiment, tomato plants, kept from fruiting, were grown in carefully washed quartz sand and supplied with a nutrient solution by a constant drip method at the rate of about 1 l in 24 hr., until they reached a height of about 1 m. A part of them was then brought to the early stages of potassium deficiency.

The deficient plants were lower in ash, in percentage dry weight, and in potassium; and higher in calcium, magnesium, and phosphorus than the plants receiving a complete nutrient solution. As compared with the complete plants, the deficient were high in solids, reducing sugars, and insoluble nitrogen. The leaves were high in sucrose and the stems low in dextrin and starch on both bases. The determinations made gave no evidence of deranged nitrogen metabolism at this early stage of potassium deficiency.

The conservation of burnt lime, limestone, dolomite, and calcium silicate in soil as influenced by methods of incorporation, W. H. MacIntire, W. B. Ellett, W. M. Shaw, and H. H. Hill (*Tennessee Sta. Bul. 152 (1934), pp. 52, figs. 7; Virginia Sta. Tech. Bul. 54 (1934), pp. 52, figs. 7*).—Comparative 8-year tests were made in cooperation by the Tennessee and Virginia Experiment Stations on a well-buffered, slightly acid Tennessee Cumberland clay loam and a strongly acid Virginia Onslow fine sandy loam "to determine the conservation of, and effects induced by, four liming materials—burnt lime, limestone, dolomite, and calcium silicate—in unit, double, and divided additions with full-depth and surface-zone incorporations. The unit addition was equivalent to 2,000 lb. of CaO, or 3,570 lb. of $CaCO_3$ per 2,000,000 lb. of soil." The voluminous numerical data collected are tabulated for each year and in 4-year totals. Numerous conclusions regarding details of the results are summarized.

The use of limestone in mixed fertilizers, J. W. Tidmore and C. F. Simmons (*Alabama Sta. Circ. 67 (1934), pp. 8*).—"Experiments are cited which show that the incorporation of limestone with the fertilizer (to the extent of neutralizing the acids developed) resulted in an increase of approximately 50 lb. of seed cotton per acre." Results are given showing that most of the mixed fertilizers sold in Alabama during 1933 were acid forming. For

these fertilizers, the limestone requirement was 25,546 tons. The limestone requirement of the high-grade fertilizers was greater than that of low-grade fertilizers. Figures are given which show that for about $80,000, limestone might replace sand as a filler in mixed fertilizers which would result in an increase in the value of the cotton crop produced in Alabama by approximately $4,500,000 per year."

The effect of boron on the development of the sugar beet in water cultures [trans. title], M. A. BELOUSOV (BELOUSSOW) (*Trudy Tsent. Nauch. Issledov. Inst. Sakh. Promysh.* (*TSINS*) [*Moskva*] (*Trans. Cent. Sci. Res. Inst. Sugar Indus.*), *No. 8 (1932), pp. 50–60, figs. 2; Ger. abs., pp. 59, 60*).—Solution culture experiments with sugar beets confirmed previous observations that boron is an element as indispensable in plant nutrition, although needed only in very low concentrations, as are any of the other fundamental plant nutrients. Within the range from 0.5 mg per liter of boric acid to 10 mg per liter both the leaves and the root system of the sugar beet developed normally, all stages of growth showing an entirely natural appearance. When the boric acid concentration was raised to 25 mg per liter, however, injurious effects appeared even in the seedlings. Plants grown in the absence of boron, on the other hand, began to show the lack of this element in a few days. Growth ceased, the root hairs disappeared from the roots, the leaves ceased to develop, and a general disturbance of the physiological functions of the plant was evident. Controls grown under like conditions but in the presence of suitable quantities of boric acid showed normal growth and a root system covered with white root hairs.

The sugar beet was found to show a high degree of sensitiveness to traces of the heavy metals, being injured by quantities so small as to be well tolerated by other plants. Adding suitable small quantities of boric acid to culture solutions thus poisoned by traces of the heavy metals increased the resistance of the beet plants and permitted their normal growth.

AGRICULTURAL BOTANY

Fundamental concepts in plant research, J. F. BREAZEALE (*Arizona Sta. Bul. 147 (1934), pp. 61–84, fig. 1*).—This is a somewhat philosophical discussion of the relation of plants to their environment, in which the plants of any particular species are viewed as reflecting (1) the influence of the age-long adaptive struggle of their ancestors with the environmental complex under which they developed, and (2) an immediate response in a species-preserving direction to changes in their situation brought about by natural causes or through the efforts of man. The author argues for inclusion of these broader concepts in the search of workers in plant science for the reasons underlying the phenomena they are studying.

Symptoms of malnutrition manifested by the sugar cane plant when grown in culture solutions from which certain essential elements are omitted, J. P. MARTIN (*Hawaii. Planters' Rec., 38 (1934), No. 1, pp. 3–31, pls. 4, figs. 18*).—In order to learn the characteristic effects on sugarcane of various types of nutritional deficiency, sprouts of three varieties were grown in a standard nutrient solution for 6 weeks. Plants of uniform size were transferred to gallon earthenware jars, glazed inside, containing a series of nutrient solutions from each of which one of the following elements was omitted: N, Fe, P, S, Mn, K, Ca, and Mg. They were grown thus in a greenhouse for 216 days, except that for most of the series one plant was transferred back to the complete nutrient solution for the last 84 days. Similar

experiments were repeated in water cultures and in sand cultures. The unique deficiency symptoms developed for each of the elements tested are described and illustrated by colored plates. The probable functions of each of these elements in the vital activities of the plant are noted.

The ferns of Oklahoma, H. I. Featherly and C. E. Still (*Oklahoma Sta. Circ. 80 (1934), pp. 24, figs. 41*).—This circular contains an analytical key to 41 species of ferns occurring in Oklahoma, with descriptions and notes on habitat and distribution, illustrated by line drawings and accompanied by a glossary and a bibliography.

GENETICS

Cytological studies on the peanut, Arachis.—I, Chromosome number and morphology, **L. Husted** (*Cytologia, 5 (1933), No. 1, pp. 109–117, figs. 3*).—Counts at the University of Virginia showed the somatic chromosomes of several previously unreported varieties and lines of *A. hypogaea* to number 40. In all forms examined one pair of chromosomes was conspicuously smaller than any of the others of the complement, all the chromosomes possessed median primary constrictions, and secondary constrictions were present. The small chromosomes varied in length from 0.8μ to 1.3μ, the next in size from 1.2μ to 1.7μ, and the largest from 1.9μ to 2.7μ, depending upon the fixative and stain used. The haploid number of one bunch and two runner varieties of *A. hypogaea* was found to be 20, irregular chromosome association was observed, and secondary association was present. There seemed as yet to be no cytological evidence to support Waldron's hypothesis of dual origin (E.S.R., 53, p. 236). Examination of 8 runner type and 8 bunch type strains of *A. hypogaea* did not reveal differences in chromosome number.

Cytological studies on compactoid types of Triticum vulgare [trans. title], **A. Håkansson** (*Hereditas, 17 (1933), No. 2, pp. 155–196, pl. 1, figs. 14; Eng. abs., pp. 193, 194*).—Compactoids (subcompactum), plants with short culms and dense spikes, appear in progenies of B-type heterozygous speltoids, are heterozygous, and segregate into normal, subcompactum, heterozygous speltoids, dwarf compactoids, and other types. Their genetics has been treated by Lindhard (E.S.R., 51, p. 29) and others. Study of chromosome behavior in the first meiotic division of pollen mother cells of compactoids and their progeny revealed 20 bivalents + 1 co-chromosome + 1 no-chromosome, speltoid 20 bivalents + 1 no, normal plants 21 bivalents, and a dwarf compactoid 20 bivalents + co + co, which suggested that segregation of subcompactum is largely determined by the distribution of the no- and co-chromosomes. The relation of this phenomenon to the formulas of Winge (E.S.R., 58, p. 426) and Huskins (E.S.R., 60, p. 525) is also discussed, with remarks on trisomic types with 43 chromosomes, dwarfish compactoids with the same cytology as subcompactum, and an awned compactoid characterized by one peculiar bivalent.

Haploid formation by X-rays in Triticum monococcum, Y. Katayama (*Cytologia, 5 (1934), No. 2, pp. 235–237, figs. 2*).—The percentage of haploid plants amounted to 0.48 in normal full-grown plants of *T. monococcum*, 7.4 from seed from spikes X-rayed at about meiosis where pollen was supplied to normal pistils, 17.6 when X-rayed pollen was applied to normal pistils of emasculated plants, and 0 when X-rayed pistils received normal pollen. Reasons for this behavior are suggested.

Polymitotic maize and the precocity hypothesis of chromosome conjugation, G. W. Beadle (*Cytologia, 5 (1933), No. 1, pp. 118–121*).—Study of polymitotic corn plants heterozygous for a reciprocal translocation involving

chromosomes 2 and 5, and others trisomic for chromosome 9 or chromosome 7, did not reveal clear cases of association of homologous chromosomes or segments. Configurations suggesting chiasmata between chromosomes were attributed to overlapping. Association of chromosomes at a later stage did not appear due to chiasmata. The behavior of these plants did not support the precocity hypothesis, on which the prediction is made that homologous chromosomes, if present, will conjugate during prophase of the first extra division.

Chromosomes in hybrids between Euchlaena perennis and Zea mays, A. E. LONGLEY (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 9, pp. 789–806, figs. 3*).—Cytological studies made on F_1 and later hybrid generations showed that the number of chromosomes in gametes of various perennial teosinte (*E. perennis*)-corn hybrids depends upon the regular distribution of all paired chromosomes and the random distribution of all unpaired chromosomes during meioses. The random distribution occurs in the first division except in the few cases in which univalents divided in the first division, when it then occurs in the second division. The chromosome number of functioning pollen tends markedly to be euploid, while that of functioning ovules shows only a slight tendency toward the euploid numbers 10 and 20. If autosyndesis has been the rule at meioses and only euploid gametes have functioned, all diploid derivatives will be homozygous as well as true breeding, and all tetraploid derivatives will be heterozygous but true breeding. If allosyndesis has occurred, diploid and tetraploid derivatives may contain desirable combinations of parental characters, but plants homozygous for such characters are derived more readily from the heterozygous diploid than from the heterozygous tetraploid form. See also an earlier note (E.S.R., 52, p. 328).

Apomictic and sexual seed formation in Poa, A. MÜNTZING (*Hereditas, 17* (*1933*), *No. 2, pp. 131–154, figs. 21*).—Chromosome numbers in Swedish and Swiss biotypes of *P. alpina* were found to range from 22 to 38. Breeding work and cytological studies demonstrated that seed formation is apomictic in at least three of the Swedish biotypes. These biotyes have a constant chromosome number and are morphologically uniform, whereas the Swiss forms of *P. alpina* are sexual and characterized by variable chromosome numbers and variable morphology. Seven biotypes of *P. pratensis* have aneuploid numbers, ranging from ±64 to ±85, and one biotype has 2n=49 and may be regarded as heptaploid, as seven is the basic number in *Poa*. In at least four of the *P. pratensis* biotypes seed formation is apomictic, which explains the morphological constancy characteristic of single plant progenies in *P. pratensis*.

Dehulled seed, glume color, and reaction to smut in a certain oat cross, R. J. GARBER and M. M. HOOVER (*Jour. Amer. Soc. Agron., 26* (*1934*), *No. 8, pp. 673–680*).—In further studies (E.S.R., 62, p. 534) at the West Virginia Experiment Station, Black Mesdag and Gopher oats, as well as certain descendent lines from hybrids between them, gave similar smut reactions to both *Ustilago levis* and *U. avenae*. Dehulling the seed before treatment with smut spores increased infection very materially and also increased mortality among the resultant seedlings and plants. Data obtained from descendent families from certain backcrosses grown under smut epidemic conditions corroborated those obtained earlier with respect to inheritance of color of glume and to some extent the inheritance of smut reaction. The backcrosses gave no significant evidence of linkage between the gene for black glumes and that responsible for increased susceptibility to smut.

Inheritance of chlorophyll in Zinya rice, B. S. KADAM and V. K. PATANKAR (*Poona Agr. Col. Mag., 26* (*1934*), *No. 1, pp. 10–16*).—White and yellow chlorophyll deficiencies discovered in Zinya rice appeared due, respectively, to two recessive genes, *w* and *y*.

Improvement of rye through inbreeding, R. F. Peterson (*Sci. Agr., 14 (1934), No. 12, pp. 651–668, figs. 2; Fr. abs., p. 668*).—The use of self-fertilized lines in rye breeding with special reference to the increase of seed setting and seed size was studied at the Minnesota Experiment Station.

Self-pollination in the same year of various strains selfed for different numbers of generations with selection for self-fertility showed that a progressive increase in self-fertility occurred for several generations, and that from the seventh generation onward the average percentage seed setting of the strains remained in general fairly uniform.

Progeny of crosses between highly self-fertile strains showed a higher average percentage seed setting in F_1, F_2, and F_3 than the parents. Although similar results were obtained with crosses of strains of high and of low self-fertility, in general the seed setting was slightly lower and more variability was evident. In crosses between strains of low self-fertility the progeny were largely like the parents. A few plants in F_2 were rather highly self-fertile and the proportion increased somewhat in F_3 due to survival of self-fertile plants and loss of many self-sterile and weak plants in F_2. While there is an apparent dominance of high self-fertility over low self-fertility crosses, the results might be explained better on the basis of selective pollen tube growth. Seed from selfed F_1 plants of high × high and high × low self-fertility strains was plumper and had greater germinability than seed from F_1 of low × low self-fertility strains.

Three "synthetic" varieties produced by combining self-fertilized lines of Minnesota No. 2 rye having high self-fertility all had a higher average seed setting and 1,000-kernel weight than Minnesota No. 2. Two of these had a significantly higher percentage seed setting than Minnesota No. 2 rye, and one had a significantly higher kernel weight.

A method of making wheat crosses, V. H. Florell (*Jour. Heredity, 25 (1934), No. 4, pp. 157–161, figs. 2*).—In a technic described as very successful, pollen collected in creased paper slips from suitable spikes is applied with a miniature pointed spatula to stigmas on the emasculated spikes.

A new technique in cotton hybridizing, C. C. Doak (*Jour. Heredity, 25 (1934), No. 5, pp. 201–204, figs. 3*).—After the staminal column is slit with the finger nail, an adjacent petal is grasped and the entire corolla and androecium is pulled off in a single piece. Then a short section of soda straw closed at one end is placed over the stigma and style and secured to the bractioles with string or paper clips.

Studies in North American violets.—III, Chromosome numbers and species characters, A. Gershoy (*Vermont Sta. Bul. 367 (1934), pp. 91, pls. 28*).—In this third contribution to a continued study (E.S.R., 65, p. 641) the author reports that a detailed analysis made of the relationship of the stem, leaf form and dissection, and form of style and stigma to changes in chromosome number failed to show any uniform correlation. In general the relation of the modifications in species characters to chromosomal number appeared to be purely a matter of chance. Chromosome number could not be directly associated with vigor of growth and spread by propagating branches or to spontaneous reproduction of seed. Neither the capacity of the species to hybridize nor the incidence of fertility and sterility could be directly associated with chromosome number. Data on the rate of pollen tube growth in the pistils showed no definite relationship to chromosome number, leading the author to suggest that variable factors, such as the nature and the concentration of the stigmatic secretion, the relation of the pollen tubes to the tissues of the style, and finally the nature of the interaction between unlike germ cells, may be interpreted better on a physiological than on a genetic basis.

Inheritance of sex in certain seed plants, E. N. BRESSMAN (*Amer. Jour. Bot., 21 (1934), No. 6, pp. 328–349, figs. 4*).—Experiments and observations at the Oregon Experiment Station showed that sex reversals from male to female in cultivated species of hops (*Humulus lupulus*) and neuter plants are fairly common, whereas reversals from female to male are rare. Cuttings from males showing no sex reversals gave in 1931 males forming a series ranging from no sex reversal up to plants with 75 percent of female flowers, while in 1932 fewer numbers and smaller percentages of reversals occurred. Cuttings from normal males planted in 1932 showed fewer sex reversals than in 1931, but many showed percentages up to 50. Fertilizer treatments to overcome a neuter condition in which the plant bears peculiar bunches of both male and female flowers were without results. A review of literature embracing 98 titles and a table of over 100 crop, shrub, tree, weed, and herb seed plants classified as dioecious are included.

[Animal genetics investigations at the Texas Station] (*Texas Sta. Rpt. 1933, pp. 27–29, 39*).—Brief reports are given of experiments on the relation of pregnancy, lactation, heredity, age, and season to fleece weight, staple length, and diameter of fiber produced by Angora goats, by J. M. Jones, B. L. Warwick, and W. H. Dameron; inheritance of the ridgling character in goats, by Warwick; inheritance of the polled character in fine wool sheep, by Warwick, Jones, Dameron, and P. B. Dunkle; chromosome studies of sheep, crossing sheep and goats, the stimulation of ovulation in ewes during the anoestrus period by injection of human pregnancy urine, and the development of a 4-cell goat egg washed from the oviduct and reinjected into the uterus of the same animal, by Warwick, R. O. Berry, and W. R. Horlacher; and inheritance of horns in Angora goats, by Warwick.

Growth and sexual maturity in Brahma and Leghorn fowl, N. F. WATERS (*Iowa State Col. Jour. Sci., 8 (1934), No. 3, pp. 367–384, figs. 15*).—Further study of the data reported in Rhode Island Experiment Station Bulletin 228 (E.S.R., 65, p. 820), dealing with a cross between Single-Comb White Leghorns and Light Brahmas, indicated the operation of a dominant sex-linked gene for early maturity, but this was not very clear-cut and was not confirmed in matings of early- and late-maturing individuals, respectively, from the flocks of Leghorns and Brahmas.

The relationships of sexual maturity to mature weight and body weight were also not clear-cut. The growth curves of the pure breeds and the F_1s and F_2s between them emphasized the complexity of the relationship between sexual maturity and growth.

Technic for obtaining spermatozoa for physiological dairy studies and artificial insemination, F. W. MILLER and E. I. EVANS (*Jour. Agr. Res.* [U.S.], *48 (1934), No. 10, pp. 941–947, figs. 6*).—By massage of the ampullae of the ductus deferens semen containing only spermatozoa was obtained in 81 of 100 trials with 18 bulls tested in experiments by the U.S.D.A. Bureau of Dairy Industry, at Beltsville, Md. Epithelial cells were obtained by massage of the seminal vesicles.

Illustrations of the location of the accessory sex glands of the bull are presented.

FIELD CROPS

The interrelations of various probability tables and a modification of Student's probability table for the argument "t", J. R. LIVERMORE (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 665–673*).—The interrelations existing among several different types of tables of the probability integral introduced

since 1900 are set forth, with a modification of Student's[1] table for *t* for estimating the mathematical significance of a difference in one direction.

[Field crops research in Georgia] (*Georgia Sta. Rpt. 1933–34, pp. 7–19, 29, 43 44, figs. 2*).—Progress is reported briefly for agronomic experiments (E.S.R., 69, p. 199) from January 1, 1933, to July 1, 1934, including breeding work with soybeans, oats, and wheat; variety tests with soybeans and potatoes; development of one-variety cotton centers; cultural (including planting) experiments with small grain-winter legume mixtures for hay, soybean varieties, cotton, and potatoes; protection of seed corn from weevil injury by storage in mixture with road dust; effects of time and methods of planting on germination of cottonseed and of seed treatment and early planting on seed of cotton varieties; fertilizer studies with cotton comprising rates of applying nitrogen following Austrian winter peas, a rectangular experiment embracing 48 combinations of phosphorus, nitrogen, and potassium, tests of calcium phosphate and nitrogen carriers, and comparison of ammonium and nitrate nitrogen and the boron requirements of cotton plants in water cultures; fertilizer tests with potatoes and corn; hay yields of sorgo, cowpeas, and soybeans after small grain; and comparison of crop yields in rotation v. continuous culture. Several of the experiments were in cooperation with the U.S. Department of Agriculture.

[Agronomic research in Texas], E. B. Reynolds, D. L. Jones, R. E. Dickson, D. T. Killough, P. C. Mangelsdorf, R. E. Karper, J. S. Mogford, G. T. McNess, D. Scoates, B. C. Langley, P. R. Johnson, B. L. Warwick, R. G. Reeves, H. E. Rea, H. P. Smith, E. Mortensen, W. H. Dameron, R. A. Hall, R. H. Stansel, R. H. Wyche, H. M. Beachell, H. Dunlavy, S. E. Wolff, P. B. Dunkle, I. M. Atkins, F. Gaines, J. J. Bayles, J. R. Quinby, J. C. Stephens, S. E. Jones, V. L. Cory, W. H. Friend, J. F. Wood, and C. H. McDowell (*Texas Sta. Rpt. 1933, pp. 53–70, 117, 118, 122–127, 129–132, 135–137, 143–148, 150–156, 158, 159, 160, 161, 167–173, 174, 175, 178–180, 184, 186–190, 193–200, 201, 202, 203, 204, 211–214, 224, 225, 231–235, 247*).—Continued agronomic and plant-breeding experiments (E.S.R., 70, p. 172) at the station and substations reviewed briefly included variety tests with cotton, corn, sweet corn, wheat, oats, barley, rice, proso, grain sorghum, sorgo, broomcorn, flax, peanuts, soybeans, cowpeas, velvetbeans, alfalfa, lespedeza, sweetclover, and miscellaneous winter and summer legumes and grasses; trials of *Lespedeza sericea*; trials of cigar leaf tobacco varieties; breeding work with cotton, wheat, oats, barley, corn, sweet corn, rice, grain sorghum, and peanuts; development of cotton varieties adapted to mechanical harvesting; inheritance studies with cotton, corn, rice, and grain sorghum; study of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum*; natural crossing in rice; technic of crossing and asexual propagation of cotton; studies of strength of straw, lodging, and resistance to shattering in wheat varieties; cultural (including planting) trials with cotton, corn, rice, grain sorghum, sorgo, and flax; seed bed preparation studies; run-off water in relation to crop production; comparisons of corn and grain sorghums; effect of grain sorghum varieties and corn on oats and winter wheat; irrigation tests with grain sorghums and cotton; effect of continuous submergence on rice seed; border effect on field and nursery plats of rice; studies of artificial plats for field experiments; fertilizer trials with crops in rotation, corn, wheat, oats, rice, peanuts, and cotton; fertilizer experiments in control of cotton root rot; effect of fertilizers on length of cotton fiber; effect of previous cropping and of zinc sulfate on cotton yield; fertilizer placement studies; green manures for various crops; germi-

[1] Metron, 5 (1926), No. 3, pp. 105–108.

nation and longevity of the seed and control of bitterweed; control of prickly pear; weed-control tests; pasture improvement and management investigations; trials of crops and pasture mixtures; soil-fertility and moisture-conservation studies; and crop rotations. Certain phases of work were in cooperation with the U.S. Department of Agriculture.

Late-sown emergency feed crops for Illinois, L. H. Smith (*Illinois Sta. Circ. 423* (*1934*), *pp. 8*).—Varieties, cultural and harvesting requirements, seed supply, and the merits as late emergency feed crops, particularly in regard to severe drought and chinch bug attacks, are indicated briefly for soybeans, cowpeas, corn, Sudan grass, rye, millet, sorghum, rape, buckwheat, and mixtures of soybeans or cowpeas with Sudan grass, millet, sorghum, or corn.

Pastures for Alabama (*Alabama Sta. Leaflet 7* (*1934*), *pp. 8*).—Suggestions based on preliminary results of pasture experiments in Alabama are given on selecting, preparing, and seeding pasture land; fertilizers; the merits of various pasture plants; pasture mixtures; pasture management; and on crops and methods for temporary winter and summer pastures.

Permanent pastures, M. Nelson (*Arkansas Sta. Bul. 307* (*1934*), *pp. 18, figs. 4*).—In studies of available grasses and legumes, only Bermuda grass was found to be a reliable permanent pasture grass for Arkansas conditions. Dallis grass developed poor stands, and carpet grass did not respond outside of the Coastal Plain area. Only hop, bur, and white clovers of the many legumes tried proved suitable as supplements to grasses in the cool weather season. They were effective for early pasturage and successful in reseeding. Grasses and legumes common in the Middle and Northern States could not survive hot, dry periods in midsummer. Permanent pastures seemed impossible without an adaptable perennial grass (Bermuda) which could endure heavy grazing. The pasture combination of Bermuda and Dallis grasses and common lespedeza for the warm season and hop, bur, and white clovers for the cool season was by far the most satisfactory. In the effort to prolong the grazing season of permanent pastures, the hop, bur, and white clovers were effective in spring, but natural conditions prevented their effective growth in the fall. The grazing season closed when Bermuda grass stopped growing.

When an unfertilized pasture and one receiving complete fertilizer were grazed by grade steers at the Cotton Branch Station from 1930 to 1933, the 4-yr. average gains in weight of stock were 248.7 and 341.5 lb. per acre, respectively, with 95 percent or more of the net gains for the season being made before July 1. Due to variable rainfall, acre returns from fertilizer varied with seasons from 70 to 200 lb., averaging about 100 lb. The carrying capacity averaged 1.73 animals per acre on unfertilized pasture and 2.25 on fertilized pasture. At the Fruit and Truck Branch Station in 1933, grade Hereford yearlings gained 331 lb. per acre on pasture receiving nitrogen only and 302 lb. on pasture treated with lime, phosphorus, and potassium. The effect of phosphorus on the legumes tended to offset that of nitrogen on the grasses. Varying with seasons, the grazing season began from about April 1 to 20 and closed from October 1 to November 1. Weed control and resting the pastures during winter proved to be important management practices.

Grassland retrogression in Devonshire permanent pastures, E. W. Fenton (*Jour. Ecol.*, *22* (*1934*), *No. 1*, *pp. 279–288*).—Study of the composition of the vegetation in numerous permanent pastures revealed gradations from the best type where *Lolium perenne* and *Trifolium repens* were dominant to scrub grassland characterized by masses of shrubby plants and sometimes trees which may cover more than half the total area. The influence of stocking

and grazing, soil fertility, drainage, and other factors in the retrogression or improvement of grasslands through the several groups and classes is pointed out.

The effect of lime on permanent pasture, A. F. R. Nisbet (*Scot. Jour. Agr., 17 (1934), No. 3, pp. 281–287*).—When permanent pastures at three centers in southwest Scotland received limestone equivalent to 2 tons of calcium carbonate per acre and at the Hutchinson and M'Lennan lime requirement rate, bent and sweet vernal (where present) were reduced considerably and Yorkshire fog slightly. Orchard grass increased slightly, and fine fescue and meadow grasses made remarkable increases. Crested dogtail like fine fescue made substantial increases when competition with bent and sweet vernal were reduced. In general, treatment at the heavier lime requirement rates indicated greater responses than at the 2-ton rate.

A comparison of several legumes with respect to nitrogen accretion, T. L. Lyon and J. A. Bizzell (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 651–656*).—When various legumes, alone and in combination with other crops, were grown for 10 yr. at Cornell University on soil with an initial nitrogen content of 0.0842 percent, alfalfa and small grains alternated with it contained more nitrogen than did any other combination of legumes and cereals. Red clover and alsike clover were about equal in nitrogen contained in the crops, but their mixture was superior to either grown separately. Soybeans were the most effective of legume grain crops. The rotation omitting legumes contained the least nitrogen.

In general, the larger gains in soil nitrogen were associated with large amount of nitrogen in crops. The legumes grown for hay were the most effective in increasing soil nitrogen, while field beans caused the greatest reduction of soil nitrogen of any crop grown. The greatest apparent fixation of nitrogen was shown by alfalfa followed by sweetclover and a mixture of red and alsike clovers. All rotations which included legumes showed significant apparent fixation. The annual nonsymbiotic fixation amounted to 17 lb. of nitrogen per acre. The gains of soil nitrogen were greater and the losses less in the low-nitrogen soil than those secured on a soil with a higher initial nitrogen content.

The comparative cold resistance of spring small grains, G. L. Peltier and T. A. Kiesselbach (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 681–687*).—Efforts were made at the Nebraska Experiment Station to adapt to spring small grains methods already developed for measuring cold resistance in winter wheat and to determine the relative rating of spring wheat, oats, and barley, and possible varietal differences.

The seedling plants proved more cold resistant when emerging from the soil or in the 1-leaf stage than in the 2- or 3-leaf stages. Seedlings evidently manifest least cold endurance when food reserves of the endosperm become exhausted, and the data suggested that varietal differences as to hardiness may best be distinguished at this stage. A greater degree of cold endurance resulted from exposure to a continuous than to an intermittent hardening temperature. In order of cold endurance as hardened seedlings, these grains could be ranked as spring wheat, barley, and oats. Varieties within any crop differ materially in cold endurance. Germination was equally good at low, medium, and high temperatures. Spring wheat germinated somewhat sooner than oats and barley at a low temperature.

Distribution of fertilizer residues in the soil after fourteen years of a fertilizer experiment with alfalfa, W. H. Metzger (*Jour. Amer. Soc. Agron., 26 (1934), No. 7, pp. 620–625, fig. 1*).—Soil samples taken at various depths

from plats of a 14-year-old alfalfa stand at the Kansas Experiment Station were analyzed to determine the distribution of phosphorus and potassium residues from annual top dressings. Phosphorus from superphosphate accumulated in considerable amount at the surface, but penetrated the soil (Derby silt loam) only in small quantities where applied alone. Less easily soluble phosphorus appeared lower in the profile of plats treated with superphosphate and potassium sulfate and with potassium sulfate alone than in "no treatment" plats. Movements of phosphorus were indicated where rock phosphate or a complete fertilizer including sodium nitrate was used. Potassium movement was not marked and was limited to the surface 9 to 12 in. Where potassium sulfate was applied alone, slightly more than one-half the potassium added remained as a residue in the surface 6 in. It was more completely utilized by the alfalfa when applied with other fertilizer salts. Surface-applied lime penetrated the soil only about 6 in. during the 14 yr.

Subsoil moisture and crop sequence in relation to alfalfa production, *T. A. Kiesselbach, A. Anderson, and J. C. Russel* (*Jour. Amer. Soc. Agron., 26 (1934), No. 5, pp. 422–442, figs. 2*).—Earlier studies at the Nebraska Experiment Station on depletion of subsoil moisture and consequent decline in yields of prolonged alfalfa and low yields of subsequent alfalfa plantings (E.S.R., 56, p. 734; 61, p. 518) led to inquiry whether restoration of subsoil moisture might be accelerated profitably by cultural treatments before reseeding with alfalfa, and whether another legume might be grown to better advantage where the subsoil moisture was depleted.

After the crop season of 1927, a field cropped to alfalfa during the preceding 6 yr. contained an average of 14.7 percent moisture to a depth of 15 ft., as compared with 19.9 percent in land in bromegrass. Subsequent to 6 yr. cropping to alfalfa, 1.25, 6.37, and 21.42 in. of water were restored to the upper 15 ft. of soil as a result of 5 years' cropping to a 3-year grain rotation, to continuous corn, and to summer fallow, respectively. Moisture stored from the 6- to 15-ft. levels under these respective treatments was equivalent to 0.13, 3.12, and 13.17 in., or 0.1, 2.4, and 10.3 percent of the total rainfall.

No material change in subsoil moisture occurred after 5 yr. of cropping to alfalfa, sweetclover, and red clover on land depleted of available subsoil moisture by previous alfalfa. On land not cropped before to alfalfa and relatively high in available subsoil moisture, no material change in soil moisture took place below the sixth foot after 5 years' cropping to sweetclover and red clover. When cropped to alfalfa, however, the subsoil moisture was nearly exhausted to 15 ft. by the end of the fourth year. On land depleted of subsoil moisture to great depths by 6 years of alfalfa, relative yields during a 4-year period of subsequent cropping to alfalfa, sweetclover, and red clover were 100, 95, and 111 percent, respectively, and on land not previously in alfalfa 100, 68, and 88 percent. Alfalfa seemed superior in yield to the clovers on upland growing it for the first time, but sweetclover or red clover may equal or surpass it in tonnage where the subsoil moisture has been depleted.

The average annual alfalfa yield was 4.19 tons per acre during 4 yr. on land not cropped previously to alfalfa, on a comparable old alfalfa meadow 2.37 and on a new stand on old alfalfa sod 2.87, with 5-year totals of 16.76, 11.6, and 11.46 tons, respectively. During 3 yr. following 1 yr. of fallow on alfalfa sod alfalfa averaged 3.33 tons per acre, on land not previously cropped to alfalfa 4.54, and alfalfa resown on alfalfa land 2.98 tons. Two yr. of fallow on alfalfa sod before seeding increased the 2-year average yield of alfalfa to 3.8 tons compared with 3.47 after 1 yr. of fallow, 2.88 with no fallow, and 4.26 tons on land in alfalfa for the first time.

Responses of Kentucky bluegrass to variations in temperature, light, cutting, and fertilizing, C. M. HARRISON (*Plant Physiol., 9 (1934), No. 1, pp. 83–106, figs. 7*).—The behavior of Kentucky bluegrass, when propagated vegetatively at the University of Chicago and subjected in sand cultures to various treatments and combinations of cutting, fertilization, illumination, and temperature, was gaged by the production, development, and survival of leaves, stems, roots, and rhizomes. The results as a whole indicated that fertilization of grass with nitrogenous fertilizers during periods of short and frequent cutting at high temperatures does not result in increased growth, but may even result in a decrease. Several factors, such as short and frequent clipping, shade, short cloudy days, nitrogen fertilizers, heavy waterings, and high temperatures tend toward the using up of available stored carbohydrates and, if carried to such extreme that these carbohydrates are exhausted and not made available through activity of additional leaf area, may bring about ultimate death. Short and frequent cutting and fertilizing with nitrogen may help considerably in producing a denser turf provided the plants have a carbohydrate reserve, or a ready means of its manufacture, and the weather remains cool and bright.

The anthocyanin plant colors and yield in corn, R. A. BRINK (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 697–703*).—Comparative productivity tests at the Wisconsin Experiment Station of corn with four different anthocyanin plant colors and with residual inheritance, except for genes closely linked with the color factors themselves, supposedly averaging the same for each class, showed the purple type to be inferior to the standard dilute sun red which characterizes most present varieties of economic importance, whereas dilute purple and sun red made significant yield increases over the standard. The dry weight of ears per plant averaged for purple 0.433 lb., dilute purple 0.561, sun red 0.569, and dilute sun red 0.511 lb.

Lespedeza (*Alabama Sta. Leaflet 6 (1934), pp. 4*).—Cultural methods and field practices are outlined for growing annual lespedeza for hay and pasture and *L. sericea* for pasture. The merits of varieties of the annual and strains of *L. sericea* are indicated briefly.

Oat variety and production studies, C. K. MCCLELLAND (*Arkansas Sta. Bul. 301 (1934), pp. 30, fig. 1*).—Variety tests with winter and spring oats over more or less extended periods, planting experiments, and selection for better strains of common varieties are reported on, with remarks on cultural and climatic factors affecting yields and on dust treatments for control of oats smut.

Lee, Custis, Culberson, Turf, and the more hardy Redrustproof strains gave the best results among winter varieties, although at the Rice Branch Station after mild winters or when crown rust prevailed Redrustproof outyielded hardier strains. Fulghum, Burt, Kherson, Sixty Day, and Early Champion led the spring-grown oats. The merits of selections from common varieties are pointed out.

Winter oats outyield spring oats, even when an occasional crop is lost by winter-killing, and can also serve as winter cover and pasture. Factors important to success with winter oats are hardy strains, a compact well-drained seed bed, and good fall development, which depends on date of planting, soil fertility, and fall moisture conditions.

Seeding tests indicated a 10-pk. rate for spring oats at the station and from 7 to 9 pk. for winter oats at the Rice Branch Station, and as the optimum time for planting winter oats, late September on higher elevations and October 1 to 10 in the Cotton Belt, with early planting for spring oats. Oats in rotation after corn with legumes in the middle made no average gain, and only from 2 to 11 percent gain after corn with legumes in the same rows. Oats after

corn following a legume crop turned under yielded from 7 to 9 percent more than after corn without legumes, but made from 5 to 15 percent less when the legumes were cut for hay. Some relation was evident between yields and cold nights of March, April, and May, or low average temperature of May, but no direct relation between yield and rainfall could be found. Smut was controlled effectively by use of formaldehyde or with Corona, Ceresan, or Dubay dusts.

Effect on the growth of oats of copper sprays used for the control of mustard, O. Butler and R. Bissey (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 693–697*).—The growth, injury, and yields of oats grown at the New Hampshire Experiment Station, alone and with mustard in pots variously sprayed with solution of copper nitrate and also copper sulfate, demonstrated that the crop is sensitive to copper sprays and that recovery is slow and possibly never complete. The extent of injury produced just after spraying seemed to affect the degree of recovery. The copper nitrate depressed oats yields very nearly proportional to the concentration. Copper sulfate proved less injurious. When the strength of spray used caused no injury the loss in yield was not materially greater than when mustard was clipped out, suggesting that the strength of a copper spray or any herbicide should be adjusted to give the weed control desired with minimum injury to the cereal.

Peanuts (*Alabama Sta. Leaflet 5 (1934), pp. 4*).—Information is given on the soils, fertilizers, varieties, and cultural and harvesting methods suitable for peanut production in Alabama, with remarks on their use for hogging off, soil improvement, and oil production.

Fertilizer placement studies with the potato on prominent soil types in 1932, B. E. Brown and G. A. Cumings (*Amer. Potato Jour., 11 (1934), No. 6, pp. 141–147, fig. 1*).—Further studies (E.S.R., 68, p. 325) by the U.S. Department of Agriculture cooperating with the Maine, Michigan, New Jersey, Ohio, and Virginia Truck Experiment Stations are reported. Placement of fertilizer as a side application in equal bands on each side of the potato set proved superior to fertilizer applied below or above the set. No great difference appeared between placement of fertilizer to the side and on the same plane and placement to the side and below the set level. In a number of trials, particularly on heavier soil, placement of fertilizer as far as 4 in. away from the set resulted in comparatively low yields. Fertilizer applied above the set usually produced lower yields than side placements when not too far from the set. Individual hill studies disclosed that placements either above or below the set produced fewer but heavier tubers to the hill than lateral placements. No great difference was found in the effectiveness of ordinary strength and concentrated fertilizer mixtures.

Fertilizer for potatoes, P. H. Wessels (*Amer. Potato Jour., 11 (1934), No. 3, pp. 57–60*).—In fertilizer experiments with Green Mountain potatoes, 1928–33, on Sassafras silt loam on the Long Island Vegetable Research Farm, decreases in yield resulted from annual rates per acre smaller than 60 lb. of nitrogen, 115 lb. of phosphoric acid, and 60 lb. of potash, whereas no greater yield came from substantial increases in these nutrients.

The response of potatoes to magnesium under various soil conditions, H. C. Knoblauch and T. E. Odland (*Amer. Potato Jour., 11 (1934), No. 2, pp. 35–40*).—A magnesium deficiency characterized by reduced yields and a chlorotic condition of potato plants was found by the Rhode Island Experiment Station to be more severe on acid soils and where commercial fertilizers had been used in large quantities for a number of years. Supplying magnesium to various phosphorus carriers under acid soil conditions resulted in marked

increases in yields, and the several forms of magnesium used were found equally effective when supplying at least 25 lb. of magnesium oxide per acre.

Green manures in potato rotations, J. Bushnell (*Amer. Potato Jour., 11 (1934), No. 5, pp. 117–122*).—Certain practical advantages in using nonlegumes, as rye, corn, and buckwheat, as green manure for potatoes were evident in Ohio Experiment Station experiments. Nonlegumes can be grown more successfully than legumes on soils at pH 5.5 or lower, and a rotation can be arranged which probably will escape danger of wireworms and grubs. Use of nonlegumes, as corn, is advocated where legumes fail to maintain the soil in proper physical condition, where they do not thrive because of soil reaction, or where wireworms appear because sod or small grains were part of the rotation.

Influence of storage temperatures on the rest period and dormancy of potatoes, R. C. Wright and W. M. Peacock (*U.S. Dept. Agr., Tech. Bul. 424 (1934), pp. 22*).—The rest period in potatoes is defined as the period immediately following harvest during which they will not sprout even if kept under favorable growing conditions, while the dormant period includes the rest period and may extend over such time as potatoes may be kept at temperatures unfavorable for growth without physiological break-down.

In a study of the influence of storage temperatures ranging from 36° to 70° F. on the rest period and dormant period of six varieties of potatoes grown and stored at Arlington, Va., early-planted potatoes maturing during the heat of summer, when stored at 40°, had from 1 to 6 weeks' shorter rest period than those maturing in early November. A tendency toward shortening of the rest period as storage temperature increased was evident. The rest period of late-maturing (late-planted) potatoes of Irish Cobbler, Triumph, Early Rose, and Spaulding Rose varieties averaged 5.5 weeks shorter at 60° storage than at 36°, but storage temperature had little influence upon Green Mountain and Russet Rural. At 40° storage, the rest periods of late-maturing crops were for Spaulding Rose 9.3 weeks, Early Rose 10.7, Green Mountain 13.5, Russet Rural 14, Irish Cobbler 15, and Triumph 15 weeks. Data for other temperatures are also included. The rest period of immature potatoes of all varieties averaged between 1 and 8 weeks longer than that of mature potatoes, whereas the latter were dug, on an average, 2 weeks later.

The dormant periods of mature potatoes when left at temperatures ranging from 40° to 70° until they sprouted were also determined. The time required for all tubers of a given lot to sprout was for Early Rose 16.5 weeks, Spaulding Rose 19, Russet Rural 20, Triumph 23, Irish Cobbler 24.5, and Green Mountain 26 weeks.

The time required for 100 percent germination of tubers in the sprouting room after various preliminary periods in storage at different temperatures is also reported for the same varieties.

Some observations on the sprouting habits of potato tubers exposed to low temperatures, R. R. Hurst and H. L. MacLaren (*Amer. Potato Jour., 11 (1934), No. 5, pp. 123–127*).—A series of tests designed by the Dominion of Canada Department of Agriculture to study the reaction of potato tubers subjected to low temperatures revealed that sprouting tendencies were influenced very largely by the duration of the exposure. Tubers exposed to 24° F. for 60 min. produced slightly larger and more vigorous sprouts than did unexposed check tubers, although sprouting capacity was affected adversely by exposures at lower temperatures. Definite relationships were indicated between length of sprouts and duration of exposure. In general, the longer exposures seemed detrimental, especially at the lower temperatures, e.g., exposure at 11° for 25 min. arrested sprout growth and caused necrosis and exterior spotting.

Growing seed potatoes under an aster cloth cage, D. Folsom (*Amer. Potato Jour., 11 (1934), No. 3, pp. 65–69*).—Data on costs, results, and precautions to be observed are given from Maine Experiment Station tests.

Soybeans (*Alabama Sta. Leaflet 2 (1934), pp. 4*).—Practical suggestions, based largely on results of station experiments, are made on choice of soybean varieties for hay, grazing, soil improvement, and bird feed, and on cultural and harvesting practices.

Soybeans for Massachusetts, A. B. Beaumont and R. E. Stitt (*Massachusetts Sta. Bul. 309 (1934), pp. 16, figs. 5*).—Highest yielding varieties in tests made from 1929 to 1931 in cooperation with the U.S. Department of Agriculture included Dunfield, averaging 3.02 tons of hay per acre, Habaro 2.75, Medium Green 2.74, Harbinsoy 2.7, and Virginia 2.67 tons. The first four varieties are favored by an erect or suberect growth, the fine stems of Dunfield and Habaro making them preferable for hay.

Forage production, with some exceptions, was found in inverse ratio to seed production. Seed production varied widely with season. A planting experiment demonstrated that seed may be sown as deep as 2 in. in light sandy loam or sand without reduction in stand, while about 1 in. is the best depth in heavy loams. Seedlings emerged slowly or not at all from cold soils.

Production practices, the utilization of the seed and hay, and pests of the crop are discussed briefly. The greatest promise of the soybean in New England lies in its possibilities as a forage crop. While it can hardly compete with grasses, clovers, and alfalfa as a principal source of forage, it has distinct advantages as a temporary or emergency legume forage crop.

Border effect in sugar beets, G. W. Deming and H. E. Brewbaker (*Jour. Amer. Soc. Agron., 26 (1934), No. 7, pp. 615–619, fig. 1*).—Data obtained by the Colorado Experiment Station and the U.S. Department of Agriculture with sugar beets in a time-of-planting experiment at Rocky Ford and a variety trial at Fort Collins suggested that when strongly unbalanced conditions of competition between plats are anticipated enough rows per plat should be provided so that the two outer rows on each side may be discarded.

The sugar cane plant: A study of millable cane and sucrose formation, U. K. Das (*Hawaii. Planters' Rec., 38 (1934), No. 1, pp. 33–94, figs. 38*).—The composition of a sugarcane crop and its influence on cane yield and juice quality were studied in March and September plantings of the H 109 variety. A cane crop at any time was shown to consist of stalks of different ages and in different stages of vigor and maturity. Average yield and quality are naturally influenced by the relative proportion of these stalks at different ages.

Suckering appeared to be a continuous phenomenon in a field of sugarcane and influenced primarily by self-shading due to plant competition. Independently of season the number of suckers reaches a maximum between 4 and 5 mo. of age, which is followed by a decline to a more or less stable number of about 3 stalks per foot for H 109. Under the experimental conditions a crop of H 109 consisted very largely, 80 to 100 percent, of stalks germinating within 3 mo. after planting. March-planted cane appeared to be better suited to a long crop and September-planted cane to a short crop. The effect of tasseling and the time of last fertilization seemed to have an important bearing on crop yield. Excellent juices were obtained from both first- and second-season cane in spite of a continuous application of 4 in. of irrigation per week up to harvest. There was no indication of deterioration of juice with age in those stalks that remained sound.

Millable cane could be divided as to quality into dry leaf, and green leaf, i.e., the part of the millable stalk where green leaves are still attached. At

any stage in plant development, the dry-leaf section appears to be more or less mature and beyond the reach of ordinary cultural treatments, whereas active accumulation of sucrose is still going on in the green-leaf section. The average juice of the whole stalk is a composite of these two sections and must be influenced greatly by the relative proportion of their juices by weight. The difference in the average quality of old cane and young cane may then be due primarily to the difference in the ratios of these two parts. It is suggested that maturity may more logically be considered as the shortening of the minimum of the green-leaf section than as an arbitrary concentration of sucrose or glucose in the stalks.

Other pertinent factors discussed include variations from stalk to stalk and within the same stalk, and effects of tasseling, lalas or side shoots, borer and mechanical injuries, shading, fertilization, and soil temperature.

Soil moisture and the sugar cane plant, H. A. WADSWORTH (*Hawaii. Planters' Rec., 38 (1934), No. 2, pp. 111–119, figs. 5*).—This review of research in Hawaii and elsewhere treats of soils and soil-moisture relationships, the relation of the sugarcane plant to soil moisture, and water absorption by the cane plant.

Industrial preservation of crop fibers, E. C. LATHROP and T. B. MUNROE (*Indus. and Engin. Chem., 26 (1934), No. 6, pp. 594–598, figs. 2*).—The development of a commercial process for the preservation of sugarcane bagasse during storage as described may apply with slight obvious modifications to industrial preservation of other crop fibers exposed to weather. The best method consists in so piling the bales that the heat of carbohydrate fermentation is used to raise the temperature of interior bales to that corresponding to pasteurization. The insulating qualities of the mass maintains this temperature for 2 or 3 mo. The moisture content of the mass is lowered greatly so that spores of organisms living through the heating stage may not germinate. The outside of the pile is protected from rain by a portable roof of steel panels, and also by sprinkling boric acid on the edges of the outside bales and on tops of the top bales of the pile. The average fiber loss per annum is said to be less than 10 percent, being reduced more than 60 percent. The chemical cost is 6.4 c. per ton of dry fiber. The yearly cost of chemicals and roof is offset by savings in labor in removing the piles, due to time saved in handling solid rather than broken bales.

[Sugarcane experiments in Queensland, 1932–33], H. W. KERR ET AL. (*Queensland Bur. Sugar Expt. Stas. Ann. Rpts., 32 (1931–32), pp. 5–45, 58–60, figs. 2; 33 (1932–33), pp. 5–53, 71–76, fig. 1*).—The current progress of research with sugarcane is reviewed as heretofore (E.S.R., 68, p. 613).

The relation of leaf size to root structure in Trifolium repens, G. H. BATES (*Jour. Ecol., 22 (1934), No. 1, pp. 271–278, pls. 2*).—In experiments with white clover, leaf size could be reduced by cutting or crushing the leaf, which interferes with root nutrition, thus affecting root range. A restricted root range results in a limited water supply, which automatically produces a smaller leaf and a smaller area of transpiration. Direct root pruning produced similar results. Indicating that soil acidity may occur throughout the soil or in strata, the author shows that when acidity restricts root development leaf size is also reduced in proportion to the degree of root restriction.

Furrow versus surface planting winter wheat, T. A. KIESSELBACH and W. E. LYNESS (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 289–292*).—In comparative tests at the Nebraska Experiment Station during 3 yr. (1930–32), Cheyenne winter wheat planted with three standard furrow drills averaged

34.3 bu. per acre, with the standard 7-in. surface drill 42.1 bu., and with the same surface drill with 14-in. rows 37.8 bu. The inferiority of the furrow drill in eastern Nebraska seemed due largely to the unfavorable wide spacing of rows. The optimum seeding rate was the same for both types of drills. Analysis of agronomic data for the 1932 crop revealed no striking differences in plant development that could not largely be accounted for by seeding rate per acre or per foot of row. If furrow and surface planting with similar rate and row spacing are compared, the individual plant development of both is very similar.

Effect of stage of seedling development upon the cold resistance of winter wheats, C. A. Suneson and G. L. Peltier (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 687–692*).—Seedlings of several varieties of winter wheat in four 1-week interval stages of development from emergence to past tillering were compared at the Nebraska Experiment Station for cold tolerance. Very young seedlings, presumably still dependent upon the endosperm to a considerable degree, were found to surpass all other more advanced stage-of-development groups in cold tolerance. Hardening by exposure to a constant or an alternate (warm day and cold night) temperature near freezing showed that actual cold resistance increased materially from exposure up to 3 weeks and none thereafter up to 4 weeks. Varietal ranking was not affected by the duration of hardening periods used. Differences in varietal cold resistance relationships were indicated from dissimilar growing temperatures or from dissimilar ages and stages of development at the time of initiating uniform hardening and freezing. The results, together with the seasonal effects reported previously (E.S.R., 71, p. 190), seemed to indicate the importance of factors other than exposure to low temperatures and resultant high specific cold tolerance as determiners of the relative resistance of winter wheat varieties to cold.

Comparison of winter-wheat varieties grown in cooperative plot and nursery experiments in the hard red winter-wheat region in 1933, K. S. Quisenberry (*U.S. Dept. Agr., Bur. Plant Indus., 1934, pp. 56*).—Yield and agronomic data are reported from uniform plat and nursery experiments conducted during 1933 in cooperation with 10 State experiment stations in the hard red winter wheat region. A report on the resistance of important varieties to stinking smut (pp. 54–56) by H. A. Rodenhiser and Quisenberry is entitled Summary of Uniform Winter Wheat-Bunt Nursery, 1932–33.

Wheat in Great Britain, J. Percival (*Reading, Eng.: Author, 1934, pp. 125, [pls.] 63*).—The book presents an account of wheat growing in Great Britain from early times until the present day; discusses climatic and cultural requirements, yields, improvement, and classification; includes data on the distribution and commercial movement of the crop; and describes and illustrates distinct varieties grown in recent years.

Portuguese wheats [trans. title], J. de Carvalho e Vasconcelos (*Bol. Agr. [Portugal], 1. ser., 1 (1933), No. 1–2, pp. 1–150, figs. [62]; Eng. abs., pp. 131–139*).—Nearly 100 varieties and strains of wheat grown in Portugal for long periods, pertaining to *Triticum vulgare*, *T. compactum*, *T. turgidum*, *T. durum*, and *T. polonicum*, are described and classified, with determinative keys and indexes.

The wheat meal test for evaluating the qualities of small samples of wheat, H. K. Wilson and M. C. Markley (*Jour. Amer. Soc. Agron., 26 (1934), No. 7, pp. 580–586*).—The wheat-meal fermentation time test outlined by Cutler and Worzella was applied at the Minnesota Experiment Station to 30 varieties of spring wheat and 17 winter wheats. The winter wheat varieties

showed the wider differences. Spring wheat tests exhibited a positive correlation between time of dough ball disintegration and loaf volume and baking strength score as determined by milling and baking trials. Winter wheat time tests were correlated positively with strength score when the Wiley mill was used to grind the samples. The fact that the spring wheats in the trials constituted a highly selected group probably was an important reason for a narrower range of difference in the number of minutes required for dough ball disintegration than for winter varieties.

Distribution and reproduction of Canada thistle in Iowa, A. HAYDEN (*Amer. Jour. Bot., 21 (1934), No. 7, pp. 355–373, figs. 12*).—The growth, range, sexual and vegetative reproduction of Canada thistle (*Cirsium arvense*), and viability of its seed for the environmental conditions of Iowa were studied at Iowa State College from 1930 to 1932.

In 40 yr. this thistle spread from scattered initial spots to established areas in every county in Iowa. According to the climatic range now occupied in Europe, Africa, and Asia, it may advance southward in the United States 7°–10° beyond its present range. Canada thistle can produce seed throughout the climatic range of Iowa, and this seed has relatively high although variable viability and, under favorable conditions, may germinate without a rest period. Pollination and seed production require the proximity of staminate and pistillate plants, usually within 200 to 300 ft. Examination of the contents of intestines of 20 ducks fed on plant seeds and fruits revealed no significant evidence that weed seeds or fruits were disseminated in their alimentary canals. Other dissemination factors are discussed.

The weed may spread vegetatively by cuttings of horizontal or vertical roots and of upright subterranean stem shoots bearing nodes. Portions of root or of stem ⅛ to ¼ in. in diameter and ½ in. long will produce new plants under favorable conditions. Root cuttings can produce two to four times as many shoots as stem cuttings per unit length. When their food supply is low or exhausted rhizome or root cuttings produce few or no bud shoots. The subterranean system consists of vertically descending and horizontally spreading roots, both bearing obliquely or vertically ascending stem shoots or rhizomes, and has a fairly typical topography although it is quite flexible in its habit.

Resistance of wild oats and some common cereal varieties to freezing temperatures, O. S. AAMODT and A. W. PLATT (*Sci. Agr., 14 (1934), No. 12, pp. 645–650, figs. 2; Fr. abs., p. 650*).—Artificial freezing tests at the University of Alberta with wild oats and varieties of oats, barley, and spring and winter wheat and rye, together with field observations, indicated that when growth had begun in the fall there was slight possibility of wild oats surviving the winter in central and northern Alberta. This supported the recommendation for fall-disking stubble land to favor germination of wild oats seed lying on the surface and so to promote their destruction by winter-killing. Dakold winter rye, Kharkov (No. 22) winter wheat, Prolific spring rye, and Trebi barley led in average survival.

Effect of bovine digestion and of manure storage on the viability of weed seeds, F. W. ATKESON, H. W. HULBERT, and T. R. WARREN (*Jour. Amer. Soc. Agron., 26 (1934), No. 5, pp. 390–397*).—Germination tests made at the Idaho Experiment Station on seeds of a number of common weeds before and after passing through the digestive tracts of cattle and after 2 months' storage in manure indicated that the digestion processes of cattle greatly reduce the percentage viability of most weed seeds under Idaho conditions, thereby tending to minimize manure as a source of weed infestation. However, the

number of viable seeds, especially of some plants, after passing through the digestive tract makes manure a possible weed menace if feeds containing large numbers of weed seeds are fed. Green foxtail, lambsquarters, curled dock, rough pigweed, and cowcockle showed considerable resistance to the digestion process. Storage of manure caused an additional reduction in percentage of viable seeds. Manure stored 3 mo. could be scattered over fields with little chance of weed infestation insofar as seeds consumed in feeds are concerned.

The effect of different methods of storing chicken manure on the viability of certain weed seeds, G. L. Stoker, D. C. Tingey, and R. J. Evans (*Jour. Amer. Soc. Agron., 26 (1934), No. 7, pp. 600–609, figs. 2*).—When stored at the Utah Experiment Station in wire containers in chicken manure in different ways for various periods, and removed and germinated at intervals of from 10 days to 4 mo., the viability of morning-glory seed was not destroyed. Whitetop and Russian knapweed seeds lost their viability after being in moist loose manure for 20 days, or after being in moist compacted manure for 1 mo., but in unmoistened piles their viability was not destroyed completely at the end of 4 mo.

HORTICULTURE

[Horticulture at the Georgia Station] (*Georgia Sta. Rpt. 1933–34, pp. 30, 31, 41–43, 50–58, figs. 3*).—Covering the calendar year 1933 and the first 6 mo. of 1934, this report includes brief progress statements (E.S.R., 69, p. 209) of investigations relating to the iodine content of turnips; yield and quality of oil from tung nuts; preservation of fruits and vegetables by freezing; effect of frost and freezing on the peach crop in the mountainous section of north Georgia; improvement of the apple by selection of promising native seedlings; variety testing of cherries, peaches, blackberries, raspberries, blueberries, grapes, strawberries, and vegetables; crossing of blackberries, dewberries, and raspberries; culture of chicory; the size of nuts and percentage of kernels in pecans; grafting of grapes; pruning of young tomato plants before setting; source of tomato plants; longevity of peach trees; distribution of pecan roots; mulching of raspberries; and the use of wrappers in preserving quality in various fruits and vegetables.

[Horticulture at the Texas Station], S. H. Yarnell, G. W. Adriance, F. R. Brison, J. F. Rosborough, R. A. Hall, P. R. Johnson, R. H. Stansel, H. M. Reed, R. H. Wyche, D. L. Jones, F. Gaines, J. J. Bayles, H. F. Morris, W. H. Dameron, W. H. Friend, W. J. Bach, J. F. Wood, L. E. Brooks, E. Mortensen, and L. R. Hawthorn (*Texas Sta. Rpt. 1933, pp. 20–26, 127–129, 132, 133, 137, 138, 148, 156, 157, 181, 182–184, 190–193, 201, 217–224, 235–237, 238–246*).—In presenting the usual progress report (E.S.R., 70, p. 182) brief discussions are presented of the results of studies of varietal and strain susceptibility of tomatoes to tomato pocket, the inheritance of this character in crosses between resistant and susceptible varieties, inheritance in raspberry-dewberry crossings and selfings, and time of planting of iris at the main station, and of general varietal, fertilizer, and adaptability studies with fruits, vegetables, and ornamentals at the Beeville, Tyler, Angleton, Beaumont, Lubbock, Balmorhea, Nacogdoches, Weslaco, Iowa Park, Sonora, and Winter Haven Substations.

In addition to general studies there were conducted at Nacogdoches self-pollination, fertilizer, thinning, and pruning studies with blackberries; breeding experiments with cantaloups; and fertilizer studies with peaches.

At Weslaco there were conducted experiments with citrus fertilizers, citrus rootstocks, citrus storage, factors affecting the maturity of grapefruit, citrus orchard reclamation, and varietal susceptibility of tomatoes to pocketing.

At Winter Haven studies were conducted of citrus and grape rootstocks; standardization of beet, spinach, and onion varieties; time of planting spinach; irrigation of spinach; fertilizers, storage, and irrigation of onions; spacing of tomatoes; growing of muskmelons under hotkaps; storage of cucumbers in cellophane; storage of onion and spinach seed; and the breeding of tomatoes and muskmelons.

Morphological relationships in the ontogeny of the cultivated cucumber, Cucumis sativus L., A. E. HUTCHINS (*Minnesota Sta. Tech. Bul. 96 (1934), pp. 35, figs. 7*).—Studies in 1928 on 21 varieties and inbred strains, in 1929 on 49 varieties and inbred strains, and in 1932 on an F_2 population of 300 individuals derived from a cross of two inbred lines, one with very long and the other with very short mature fruits, showed a high degree of association with respect to both length and shape, both within the variety and within a heterogeneous group, such as the F_2 population, of the cotyledons, mature leaf, unfertilized ovary, mature fruit, seed, mature internodes, height of plant, mature fruit stalk, and mature petiole. Since the differences in longitudinal growth were observed in unfertilized ovaries and in cotyledons, the author suggests that differentiation must occur at an early stage of development and may possibly be traced to differences in the growth of individual cells. Varietal differences in length and shape of several morphological characters were readily observable at a very young stage and remained relatively constant to maturity.

Apparently three genes, nonlinked or at the most very weakly linked, are involved in the inheritance of length and shape of the cucumber fruit. The genes influencing the growth relationship are not believed to be specific for a given organ but apparently affect all the organs in a similar manner. It is believed possible that the genes are not dimensional factors for length and width but are shape factors regulating the width to length relationship. Some indication was seen that the female parent exerts a greater influence on length and shape of the seed and cotyledons than does the male, and that the rate of growth may be more rapid in plants producing long than in those with relatively short organs.

Light in relation to dormancy and germination in lettuce seed, L. H. FLINT (*Science, 80 (1934), No. 2063, pp. 38–40*).—As determined in studies conducted by the U.S. Department of Agriculture, the exposure of presoaked lettuce seed to the illumination of a Mazda lamp or to sunlight exerted a profound influence on germination. Arlington Fancy lettuce seed soaked for 2 hr. in water at 20° C. and then exposed for 1 min. to illumination of 512 foot-candle minutes intensity germinated 84 percent as compared with 0 for 2 foot-candle minutes. A 4-second exposure of seed presoaked for 2 hr. to sunlight of the intensity of 1,200 foot-candles resulted in 97.5 percent germination as compared with 0 for no exposure.

Utilizing filters to separate the colors, it was found that the longer wave lengths of the visible spectrum (red, orange, and yellow) were effective, whereas violet, blue, and green lights were found not only ineffective but definitely inhibitive. Presoaked seeds exposed to favorable light and then dried retained their new germinative vigor for several weeks. By changing the quality of light the reaction of the seed could be reversed at will.

Size and arrangement of plots for yield tests with cultivated mushrooms, E. B. LAMBERT (*Jour. Agr. Res. [U.S.], 48 (1934), No. 11, pp. 971–980, figs. 2*).—Based on results of studies at Arlington Experiment Farm, Va., and in commercial mushroom houses at Downingtown and Coatesville, Pa., the author concludes that small plots containing from 40 to 48 sq. ft. are preferable to entire beds as experimental units in mushroom culture. The variance

of the small plats was in all cases less than that of entire beds, and, furthermore, the small areas permitted a greater number of comparisons and replications of the same treatment. There was observed a distinct advantage in arranging the plats on the beds so that they did not coincide with the units of areas used in preparing the beds. Where the plats overlapped the original filling areas there was markedly less variability. It is suggested that at least five or six replications be used in mushroom studies.

Storage conditions, quality, price trends, and their relation to profitable onion storage, H. M. CLEAVER (*Indiana Sta. Bul. 393 (1934), pp. 11, figs. 6*).—Records taken in commercial storage houses in northern Indiana showed that storage losses depend primarily upon the quality of the product when stored. Losses in U.S. No. 1 grade onions were 40 percent less than in onions of the same lots which just failed to meet the requirements. Temperature was found to be a potent factor in storage behavior. High temperature induced early sprouting, the most important cause of losses, and as a result it is recommended that onions be held as near 32° F. as possible. Rooting, occurring particularly in the Southport White Globe variety, was attributed to dampness. The use of dry sheds for curing, sufficient ceiling insulation, adequate ventilation, and frequent screening during the storage period are suggested as measures to reduce rooting losses. Sweet Spanish onions suffered severe shrinkage due to decay and rooting and required unusual care.

Low temperature and low relative humidity are both important considerations in onion storage, but of the two temperature is considered more critical. Southport White Globe and Sweet Spanish, because of their rooting tendency, require extra consideration with regard to humidity. The seasonal advance in onion prices during storage was generally greatest when the intermediate and late crops were small.

Tomato fertilization.—II, The effect of different fertilizer ratios on the chemical composition of tomatoes, R. L. CAROLUS (*Virginia Truck Sta. Bul. 81 (1933), pp. 1083–1117*).—Supplementing an earlier study (E.S.R., 69, p. 653) of the effect of fertilizers on yield, data are herein presented on the effects on the chemical composition of plants and fruit. In general a lack of N, P, or K in field treatments did not produce as marked changes as were obtained with nutrient solution cultures. Interesting relationships were revealed. For example, there was observed a positive relationship between the absorption of N and Mg and between Ca and Mg. There was, on the other hand, a noticeable negative relationship between the absorption of K and N and between K and Ca. A lack of K resulted in a threefold increase in the Ca content of tomato fruits. Plants fertilized with large amounts of both N and K were found to absorb these elements in excess of actual needs, a condition designated as luxury consumption.

The upper leaves and upper stems were found higher in N, P, and K than the lower leaves and lower stems, respectively. The percentages of Ca and total ash were highest in the lower leaves. Carbohydrates were generally more abundant in the stems than in the leaves. The maximum K and the minimum Ca occurred in the fruits. Mg tended to vary almost directly with Ca in all parts of the plant except the fruit. The highest percentage of Fe occurred in the roots.

The author concludes that since the tomato fruits contained approximately three-fifths of the N used by the plant, at least a part of the total application might well be withheld and used as a side dressing when the fruit is setting.

Some effects of nitrogen, phosphorus, and potassium on the composition and growth of tomato plants, G. JANSSEN, R. R. BARTHOLOMEW, and V. M.

Watts (*Arkansas Sta. Bul. 310 (1934), pp. 43, figs. 9*).—Seeking information on the relationship of N, P, and K and carbohydrate compounds, tomato plants started in sand supplied with a complete nutrient were transferred when 6 in. tall to pots of sand supplied with 15 different nutrient solutions. Two series were run, one in midwinter and the other in the spring.

The higher temperature and increased light of spring promoted in general greater fruitfulness, less succulence, and more carbohydrates. The season had little effect on plant response to P and K, but with N the seasonal effects were profound. In the winter abundant N was associated with decreased fruitfulness, whereas in the spring the reverse was true. In the spring a larger percentage of the N was in water-insoluble forms. The complete absence of N was invariably associated with a low plane of fruitfulness, but under these conditions more fruits set in the winter than in the spring.

Dry weight percentages were consistently high when N was low and when P was completely absent from the nutrient solution. The responses of dry weight percentages to P and K deficiency were, however, not as consistent as with N. In general vigorous growth was directly correlated with fairly low dry weight percentages. Low K produced a leafier type of plant than did high K, and there was some indication that low K caused an accumulation of the amino forms of N. Proteins were usually more abundant in plants receiving abundant N, but the percentage of N occurring as proteins was less than in the low N group. The percentage of P present in organic form was roughly proportional to the N supplied. The percentage of starch was high when N supply was low and generally low when K supply was deficient. The reducing and total sugars were roughly proportional to dry matter.

Tomato quality studies: Field and harvest factors affecting grade, F. C. Gaylord and J. H. MacGillivray (*Indiana Sta. Bul. 394 (1934), pp. 20, figs. 12*).—Observations over a 5-year period on a total of over 25,000 individual tomatoes tagged in the field at the first indication of red color formation showed the percentage of U.S. No. 1 fruits to average 68.3, and excluding one poor year the average was 78 percent. Tomatoes ripening during the first half of the picking season graded higher than later fruits. Sandy soil and defoliation tended to lower grade during a season of hot weather.

As the percentage of U.S. No. 1 tomatoes increased, the longer the tomatoes remained in this grade. Although in these studies tomatoes remained as U.S. No. 1 for an average of only 6.5 days, it was not unusual for individual fruits to remain in grade 1 for from 10 to 15 days and occasionally for from 20 to 25 days. No. 1 grade tomatoes usually remained in this grade longer than did No. 2 tomatoes in their grade. Color changes were found to be very rapid at the cull stage, moderately rapid in the U.S. No. 2 grade, and extremely slow in the U.S. No. 1 grade.

Biennial bearing of apple trees.—I, Blossoming and fruiting of individual spurs. II, The effect of blossom and fruit thinning, T. Swarbrick (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt. 1933, pp. 37–47*).—Detailed studies of the spur behavior on a biennial bearing variety, Lane Prince Albert, and an annual cropper, Worcester Pearmain, showed the latter variety to produce the majority of its flowers on the ends of short 1-year-old shoots. Lane Prince Albert spurs on the other hand exhibited a marked biennial tendency, and the onset of biennial fruiting apparently began in a year when all the spurs blossomed.

Flower and fruit thinning experiments with the Early Victoria apple, all trees deflorated in the beginning to bring them into uniformity, indicated that a measure of control of the bearing habit is possible. The removal

of one-half of the blossom clusters each spring resulted in a very regular annual flower production as compared with the control trees. However, cropping in the controls was much more uniform than was indicated by flower production. The thinning of fruits to one per spur following the June drop is conceded the best orchard practice in promoting annual bearing as it leaves the finest fruits on the tree.

The russeting of apples, L. Havis and J. H. Gourley (*Ohio Sta. Bimo. Bul. 169 (1934), pp. 147–155, figs. 3*).—Microscopic examination of small portions of the skin and flesh immediately below russet spots showed that when the original skin is slightly injured the superficial cells are replaced by cork cells which give the characteristic russet appearance. These cork cells formed toward the outside by a new cork cambium layer constitute the russeting noticeable to the eye. Fruits subjected to mechanical brushing or wiping machines did not show measurable loss of cuticle and apparently suffered no loss in keeping capacity. Topography was observed to be an important factor in the russeting of apples, since fruits on trees located in valleys or pockets were particularly susceptible to frost injury. Concentrated sprays were often concerned in russet formation. The addition of lime to sprays reduced injury. Spraying when the temperature was above 82° F. and when the relative humidity was high was conducive to russet formation.

A sixteen-year experiment on apricot pruning, H. S. Reed (*California Sta. Bul. 574 (1934), pp. 27, figs. 11*).—Studies at the Citrus Experiment Station, Riverside, upon the growth increment and productivity of Royal apricot trees planted in February 1916 and pruned differentially with respect to season, degree, and type showed that heading back in winter is essential to the production of size and quality in apricot fruits. Trees which were pruned by thinning of branches alone produced large crops, but the fruits were small, sunburned, and of no commercial value. The fruit of the unpruned trees was lowest of all in quality. Annual heading back during the dormant period increased the vigor of the fruiting laterals and prolonged their productive life.

Data on the relation between the amount of wood removed in pruning and yield showed no general connection between the two. The control trees outyielded all pruned plats in nearly every year, but this superiority was nullified by the low quality of the fruit. Pruning in summer, consisting in the removal of some of the new shoots from the top of the tree, when conducted in addition to winter pruning did not produce important differences either in yield or growth. In fact the differences in size between pruned and unpruned trees were not great, but the trend was toward size reduction due to pruning. Only two plats, both summer pruned, showed differences in size greater than 5 percent below the controls.

Vase form trees developed a better mechanical framework than did central leader type trees, but between the two there was found little choice, since both formed spreading heads and produced satisfactory crops. Size of fruit varied with the years, attaining a maximum in 1926, but as a whole, the relative differences between treatments were consistent.

Irrigation experiments with prunes, A. H. Hendrickson and F. J. Veihmeyer (*California Sta. Bul. 573 (1934), pp. 44, figs. 13*).—One of a series of papers (E.S.R., 69, p. 659) dealing with the water relationships of fruit trees, this study with Agen prunes on myrobalan roots presents additional evidence that the rate of growth of the fruit and the general appearance of the trees are not materially affected by soil moisture decreases until the

permanent wilting point is approached. The theory that irrigating shortly before harvest increases size markedly was not borne out by the experiments. Sugar and acid determinations of the fruit during the last 3 yr. failed to show any consistent differences attributable to irrigation.

After 4 yr. of differential irrigation treatments the trees in the continuously moist plats averaged largest and those in the unirrigated plats smallest. The same relationship was observed in cumulative yields over 5 yr. and also in annual yields. Neither time of bloom nor initiation of growth were influenced by irrigation of the preceding season.

After the trees reached the age of 10 yr. the permanent wilting percentage in the 0- to 3- and 3- to 6-ft. soil depths was reached about the same time if the soil was wet to a depth of 6 ft. at the beginning of the season or following irrigation. The permanent wilting percentages of each plat, as indicated by the appearance of the trees and change in the slope of moisture extraction curves, agreed from year to year. No evidence was accumulated that the unirrigated trees gained in drought resistance during the 10 yr. Prune trees obtained water readily near the permanent wilting point, suggesting that irrigation of prune orchards shortly before the permanent wilting percentage is reached in the upper 6-ft. soil horizon is sound practice.

The control of peach diseases and insects (*Alabama Sta. Leaflet 3 (1934), pp. 4*).—This is a brief presentation of general information, including a spray schedule.

Raspberry varieties: An identification key and notes on varietal characters, C. R. Thompson (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1933, pp. 48–59*).—Varieties are classified with relation to cane size and color, habit of growth, color of the spines on young shoots, leaf and fruit characters, etc.

Seasonal effect of lime on strawberries, A. H. Meyer (*Science, 80 (1934), No. 2063, p. 35*).—Liming experiments conducted by the author and B. Szymoniak at the Hammond branch of the Louisiana Experiment Station indicated that strawberry plants are more resistant to high soil acidity during the cool part of the year than in midsummer. Death of strawberry plants on unlimed plats in summer is believed due either to a decreased resistance to aluminum toxicity or to a greater solubility of aluminum at this time. A soil reaction of pH 5 to 5.5 was necessary during midsummer, whereas plants grew well at pH 4 during a cool season.

Winter killing of blueberries, C. S. Beckwith (*N.J. Agr. [New Jersey Stas.] 16 (1934), No. 3, pp. 7, 8*).—An inspection in 1934 of fields in various parts of the State showed on the whole very slight injury to blueberry fruit buds traceable to low winter temperatures. There was no stem killing at all. Rancocas, Pioneer, and June were damaged least of all, whereas Cabot and Rubel were injured in some fields. Much greater damage was observed in fields of hybrid varieties.

Drying Magnolia figs in Texas, H. M. Reed (*Fruit Prod. Jour. and Amer. Vinegar Indus., 13 (1934), No. 12, pp. 370, 371, 377*).—Stating that the climate of the Gulf Coast of Texas is characterized during summer by high temperature, high relative humidity, and frequent showers, conditions favorable to the growth of mold and fermenting and souring organisms, the author discusses experiments conducted at Angleton by the Texas Experiment Station. Figs allowed to tree ripen for 1 or 2 days longer than the usual hard-ripe stage yielded a better dried product than those harvested earlier. Sun-drying following sulfur treatment yielded an attractive product provided the figs were protected during rains. Dehydration or a combination of dehydration and sun-

drying proved necessary during adverse weather. Fair success was secured without artificial heat in a well-ventilated room when sulfuring was frequently given.

The physiology of cacao.—I, General observations of growth, flowering, and fruiting, E. E. PYKE ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 2 (1932), pp. 37–40, pls. 12*).—Weekly observations from June 1931 to January 1933 on two plantations of cacao showed eight distinct flushes of growth during the period, but correlations could not be established between the number of flushes or the total amount of flushing of individual trees and their yield. With reference to blossoming, there was observed a dormant period during the first 4 mo. of a given year followed by a sharp rise in May and June unaccompanied by much setting, and in a further period of blooming with setting in July and August and continuing to the end of the year. No correlation was observed between the amount of blossoming of a given tree and its yield. Two types of setting, intermittent and continuous, are believed associated with self-sterility. The wilting of young pods could not be directly associated with yielding capacity.

An environmental study of the cacao tree, J. A. MCDONALD ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 2 (1932), pp. II–IV, pls. 4*).—Observations in two localities typifying favorable and unfavorable environments indicated that cacao trees require adequate protection from wind, but that excessive shade may be harmful. Growth flushes accompanied by a change in the leaves coincided with the onset of drier conditions. Flowering and setting of fruits occurred during periods of uniformly high moisture, but many pods of all sizes turned black during excessive moisture periods.

The genetic constitution of the cacao crop, F. J. POUND ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 2 (1932), pp. 9–25*).—In this second and final portion of the report (E.S.R., 68, p. 763) the author states that the mixing of genetic types of Trinidad cacao is so complete that a random composite sample of 1,000 trees is likely to present a close approximation to the distribution of type in the entire population. Trinidad cacao is classified qualitatively into 110 types based on the shape and color of the pods. Attempts to correlate type and quantitative characters yielded interesting indications, but in the final analysis it was concluded that high-yielding trees may occur in any shape or color class and that selection cannot be safely restricted to any limited number of types. A standard sample of 30 pods from one tree gave means for pod length and diameter within 5 percent and means for shell thickness, bean number, and wet cacao weight within 10 per cent of the true mean in 95 of 100 cases. Samples composed exclusively of branch pods gave lower means than samples of trunk pods. Samples taken during the month of maximum bearing gave mean values close to the whole crop.

The vegetative propagation of cacao, III–V, E. E. PYKE ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 3 (1933), pp. 4–11, figs. 2*).—Three additional papers are presented (E.S.R., 71, p. 480).

III. *Observations on varietal differences in the rooting behaviour of cacao cuttings* (pp. 4–7).—No strains of Forastero cacao were found which were impossible or even very difficult to root from cuttings. On the other hand cuttings of *Theobroma angustifolia*, a species not used commercially in cocoa production, failed to root in calcareous sand but rooted readily in rotted woods mold. Dimorphism in rooting habit of fan and chupon cuttings of Forastero noted in the preceding report was again recorded. Surinam wild cacao was much slower in initial rooting than the Trinidad Criollo and

tended to develop vertical roots as contrasted with spreading roots of the Criollo.

IV. *Propagation by softwood cuttings under estate conditions* (pp. 7, 8).—Fan branch cuttings placed in sand beds established in the open failed to root, but when placed in covered pits yielded a reasonable percentage of rooting within 1 mo.

V. *Notes on the dimorphic branching habit of cacao* (pp. 8–11).—Hard pruning of 3-year-old cacao seedlings tended to the production of a considerable number of chupons desirable for cutting material. The severe cutting back of the scions of fan-budded nursery trees resulted, however, in serious injury, sometimes death. In a few cases chupons were obtained. The ringing of fan cuttings and fan layers a few inches above the soil resulted in chupon formations. Apparently the terminal bud of the cacao shoot may change from fan to chupon and reverse.

The variability of budded cacao, F. J. POUND (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 3 (1933), pp. 15–21*).—A study of records taken in a field of budded and seedling cacao trees showed that yield variation among budded clons is definitely less than among seedling trees from the same parents and grown under the same conditions. Evidence was obtained that the root system may markedly influence the size of bean produced by the scion and possibly also the number of beans. The author believes that the effect of the root system is solely a matter of nutrition.

Criteria and methods of selection in cacao, F. J. POUND (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 2 (1932), pp. 27–29*).—The highest yielding trees were those bearing a large number of small pods. These were, however, of less commercial value than trees bearing fewer but larger pods with larger beans. Since the majority of the heavy yielding trees were older and since a large portion of these trees bore small pods, it is conceded likely that there is a correlation between age of tree and pod size.

Further notes on criteria of selection in cacao, E. E. CHEESMAN and F. J. POUND (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 3 (1933), pp. 21–24*).—Asserting that the cacao crop of Trinidad is extremely complex and is produced in several sharply differentiated environments with respect to soil, exposure, drainage, etc., the authors propose to select a range of types each adapted to a peculiar environment. The selection range varies from 7 lb. of dry cacao per tree upward and also varies with the bean weight. The lowest limit in pod size will be 12 per pound.

Manurial experiments on cacao, J. A. McDONALD (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 3 (1933), pp. 41–49*).—Studies on six plantations of the effect of superphosphate on the productivity of cacao suggest that this fertilizer gives very marked yield increases, resulting both from a greater number and a larger size of pods. The inability to prove certain of the increments statistically significant is ascribed to the original plat lay-out, the improvement of which is also discussed.

A study of the relationship between nutrient supply and the chemical composition of the cacao tree, J. A. McDONALD (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 3 (1933), pp. 50–62*).—Analyses of cacao leaves from differentially fertilized plants indicated that the chemical composition of the leaves may be appreciably influenced by fertilizer treatment. Phosphates increased the proportion of potassium to nitrogen and produced a nutrient balance approaching the optimum. Applications of potassium alone did not have as marked an influence on the nitrogen-potassium ratio as did superphosphate, indicating that the cacao tree is unable to obtain adequate supplies of potassium when phosphates are deficient.

A preliminary survey of pigment factors in cacao, F. J. POUND ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 3 (1933), pp. 11–15*).—Discussing the probable ancestry of the Forastero cacao complex, the author expresses the belief that of the possible parents only the Caracas cacao introduced pod pigments. An examination of the progeny of self-pollinated flowers indicated that the presence of pigment is dominant to its absence in the pods and in the cotyledons. Apparently axil spot entered the Forastero complex with the dark red pod and white seeds and once present acted as an intensifier for flush pigment.

The inter-relation between pigment and pod morphology in cacao, W. E. FREEMAN ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 3 (1933), p. 33*).—Among facts established or indicated were a negative relation between pod pigment and bean pigment, a lack of correlation between bean color and that of the immature leaves and also between the presence or absence of axil spot and the percentage of light beans, the occurrence of the greatest percentage of light beans in pods having the greatest number of obvious Criollo genes, and a strong positive correlation between pod color and that of the immature leaves.

Fertility in cacao, J. MARSHALL ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 3 (1933), p. 34*).—Based on hand pollinations of 21 trees, the number is divided into 7 self-incompatible and 14 self-compatible trees in which the range of setting percentage varied from 10.8 to 72 percent. No correlation was established between quantity of blossoms and percentage of set. The consistent behavior of the individual trees is held indicative of underlying genetic factors.

Studies of fruitfulness in cacao, III, IV ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpts., 2 (1932), pp. 29–36; 3 (1933), pp. 28–32, figs. 2*).—Two additional papers in the series are presented (E.S.R., 68, p. 764).

III. *Factors affecting fruit setting,* F. J. Pound (pp. 29–36).—The author concludes that fruit setting of Trinidad cacao is the resultant of three sets of factors, namely, environment, self and intercompatibility, and nutritional relationships, such as carbohydrate-nitrogen plane. During flushes of growth there was noted a reduction in intensity of flowering. Seasonal effects were evident to the extent that in both 1931 and 1932 setting was very low in May and June and if occurring at all was confined to self-compatible trees. Insects were apparently an important factor in the setting of self-incompatible trees.

IV. *An experiment designed to test the gross effects of applications of nitrogen, potassium, and phosphorus on the cacao tree,* F. J. Pound and J. de Verteuil (pp. 28–32).—A descriptive account is presented of the scope, lay-out, and proposed procedure of a cacao fertilizer experiment designed to employ the best known methods of plat technic and statistical interpretation.

Cool storage methods of handling orange juice, A. F. CAMP and A. L. STAHL (*Fruit Prod. Jour. and Amer. Vinegar Indus., 13 (1934), No. 12, pp. 361–364, 379, fig. 1*).—Continuing earlier work at the Florida Experiment Station (E.S.R., 68, p. 124), it was found that the method of extracting orange juice has a definite effect on the flavor of the resulting product. The inclusion of oil or other materials from the rind was found detrimental. Juice extracted from peeled mature oranges on a cup type press kept at 32° F. for 1 week without material change. Deaeration of the juice gave sufficiently promising results to justify its use. The substitution of nitrogen or carbon dioxide for the air gave only slightly better results than deaeration alone. At 32° there was observed a steady decline in yeast counts during a 7-day period of observation. At 42° the trend was downward for 72 hr. and then slowly upward.

In fact the nearer freezing without actually congealing the juice the better the holding capacity of the product.

Cactus, L. A. ARMER (*New York: Frederick A. Stokes Co., 1934, pp. XI+102, pl. 1, figs. 56*).—Descriptive and commentary notes are presented on a number of the more striking forms of cacti found in the Southwest.

Daylilies: The wild species and garden clones, both old and new, of the genus Hemerocallis, A. B. STOUT (*New York: Macmillan Co., 1934, pp. X+119, pls. 36*).—Based largely on studies in the large collection of daylilies assembled at the New York Botanical Garden, information is presented on species and horticultural clons, accompanied by general information on culture, uses, propagation, breeding, etc.

The effect of nitrates on the production of sweet peas, A. LAURIE and C. LINK (*Ohio Sta. Bimo. Bul. 169 (1934), pp. 155-158*).—Sweet peas planted following the removal of chrysanthemums from the greenhouse were treated with soil and straw to reduce nitrates and with soil and certain nitrogen materials to increase nitrates. The results showed that the use of straw actually decreased nitrate content and increased production, stem length, and the number of stems bearing two or three flowers. A combination of ammonium sulfate and straw further increased production but decreased the length of stems and the number of double and triple flowers. The inoculation of seeds at time of planting with bacteria did not produce significant results. The use of manure increased production above the straw plats and increased the number of two- and three-flower stems, but the addition of ammonium sulfate to manure proved of no value. In conclusion, the authors state that the increase of nitrates was not detrimental to sweet peas whenever organic matter was incorporated, but without the addition of organic matter high nitrates were distinctly inhibiting.

Commercial flower forcing, A. LAURIE and L. C. CHADWICK (*Philadelphia: P. Blakiston's Son & Co., 1934, pp. X+519, figs. 49*).—Herein are discussed the underlying fundamentals of plant culture with their practical application to the growing of greenhouse crops.

Aristocrats of the flower border, G. A. PHILLIPS (*London: Country Life Ltd.; New York: Charles Scribner's Sons, 1934, pp. X+234, pls. [34]*).—An English text relating to the planting and care of the border and the selection of plant material to provide blooms in early, mid, and late season.

Garden flowers in color, G. A. STEVENS (*New York: Macmillan Co., 1934, pp. 320, figs. 383*).—Arranged alphabetically, this pictorial cyclopedia of flowers is designed primarily to serve as a guide to American gardeners in selecting flowers for their home adornment.

Gardens of delight, E. S. ROHDE (*Boston: Hale, Cushman & Flint, 1934, pp. XII+308, pls. 32*).—With plant materials arranged chronologically by months in which blooming occurs, descriptive and cultural notes are offered on a large variety of ornamentals occurring in English gardens.

The story of gardening, R. WRIGHT (*New York: Dodd, Mead & Co., 1934, pp. X+475, pls. 33, figs. 57*).—The development of ornamental gardening through the ages is discussed.

FORESTRY

[Forestry at the Georgia Station] (*Georgia Sta. Rpt. 1933–34, pp. 44–47, 49*).—Brief reports are presented on studies of the growth rate of trees in mountain farm woodlands; improvement of farm woodlands by thinning, etc.; stock for forest plantations; natural reproduction; and methods of seeding white pine

Ecological relations in the pitch pine plains of southern New Jersey, H. J. Lutz (*Yale Univ. School Forestry Bul. 38 (1934), pp. IX+80, figs. 18*).—Fire and not soil deficiencies is believed responsible for the peculiar dwarf tree growth on certain Plains areas in the Pine Barrens region of southern New Jersey. The small size of the trees is ascribed to their youth rather than inherent dwarfness. The average age of pitch pine and scrub oak was found to be only from 10 to 15 yr. The occasional larger and older trees observed along old roads where there had been a measure of fire protection were indicative of potentially better tree growth.

Studies of the climate, soil temperature, pH, water-holding capacity, and texture failed to show any significant differences in the Plains area as compared with adjacent and heavier forested regions. The organic matter content was, however, lower in the Plains area. Rye and oats grown in the greenhouse on soils collected from the Barrens and Plains failed to reveal any important differences in fertility. Concluding, the author suggests that fire control would probably gradually increase the proportion of better species and ultimately improve the soil through the accumulation of organic debris.

Woodland carrying capacities and grazing injury studies, D. Den Uyl and R. K. Day (*Indiana Sta. Bul. 391 (1934), pp. 12, figs. 12*).—Studies conducted by the station and the Central States Forest Experiment Station in fenced plats in a tract of farm wood on the Pinney-Purdue Farm showed that continued grazing, such as generally practiced in the Corn Belt, is lowering the cattle-carrying capacity of farm woods through the elimination of the better forage plants and also reducing the timber-producing capacity through injury to reproduction. Comparing three intensities of grazing, namely, 2, 4, and 6 acres per animal, it was found that none of the three was capable of maintaining satisfactory gains throughout an entire grazing season. There were observed definite correlations of animal weight fluctuation and climatic factors such as rainfall and temperature.

In all three plats the steers browsed hickory and black cherry seedlings before the grass and herbs were completely utilized. In the maximum density plat the two species were completely eradicated and in the other areas eliminated from large portions of the plats.

Identification of the timbers of temperate North America, S. J. Record (*New York: John Wiley & Sons; London: Chapman & Hall, 1934, pp. IX+196, pls. 7, figs. 47*).—Designed to replace an earlier publication (E.S.R., 43, p. 443), this book is prepared in two parts. The first is a general discussion of the anatomical structure and physical properties of woods and the second a key to North American timbers with notes pertaining to the trees and their utilization.

Marketing crossties and piling in southern Indiana, R. C. Brundage (*Indiana Sta. Bul. 395 (1934), pp. 50, figs. 27*).—Based on census data, personal surveys, and information derived from producers, buyers, and consumers, general information is presented on the crosstie and piling industry of southern Indiana. Approximately 96 percent of the crossties produced are utilized by the railroads, but only 15 percent are sold directly by the producer to the railroad. Red and white oaks are the most important species, comprising from 65 to 75 percent of the production.

Sawing as compared with hewing produced more crossties from the original material and usually yielded a larger profit. Trees 12 in. or more in diameter netted more grade 4 and 5 ties and yielded a higher stumpage return. The author estimates that rapidly growing stands of timber now suitable for cross-

ties or piling would net from 4 to 6 percent per annum if retained for saw logs.

With relation to piling, white, chestnut, black, red, and pin oaks, sweetgum, red and hard maples, sycamore, hickory, beech, white ash, and elm are in demand. Trees sold for piling netted approximately 20 to 35 percent more stumpage value than for ties or saw logs. However, the specifications for piling are exacting and require straight trees with little taper.

DISEASES OF PLANTS

Handbook of plant diseases, III, founded by P. Sorauer (*Handbuch der Pflanzenkrankheiten. Berlin: Paul Parey, 5 ed., rev., 1932, vol. 3, pt. 2, pp. VIII+948, figs. 195*).—Part 2 of the section on Parasites Belonging to the Plant Kingdom (E.S.R., 55, p. 242), has been completely revised and brought up to date by a group of specialists under the editorship of O. Appel. It deals with the Basidiomycetes, including rusts, by E. Köhler; smuts, by H. Zillig; Exobasidiineae, by R. Laubert; Hymenomycetineae, by E. Münch; fungi imperfecti, including the Sphaeropsidales, by R. Laubert and H. Richter; Melanconiales, by H. Pape; and Hyphomycetes, and the genus *Actinomyces* belonging to the Schizomycetes (introduced here out of order), by H. W. Wollenweber. It also includes a discussion of parasitic algae, by E. Köhler; lichens, by H. Pape; and parasitic seed plants, by E. Köhler. It is followed by an index of hosts and parasites.

This volume contains a much more complete and useful treatment than was presented in the corresponding volume of the fourth edition. Improved illustrative material and a more extensive list of references, appearing as page footnotes, have resulted in a greatly improved thoroughness of documentation.

The Plant Disease Reporter, July 1, July 15, and August 1, 1934 (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 18 (1934), Nos. 7, pp. 74–101; 8, pp. 102–112; 9, pp. 113–119*).—Among the items of current interest, these issues contain the following contributions:

No. 7.—Alaskan fungi, by E. K. Cash (listing 159 species including several not hitherto reported from North America nor from Alaska); diseases of the Austrian winter pea (*Pisum arvense*) in northern Georgia, by J. H. Miller; downy mildew of hops (*Pseudoperonospora humuli*) in California; observations of interest on nematode diseases of plants, by G. Steiner and E. M. Buhrer; and status of the Dutch elm disease, by K. F. Kellerman.

No. 8.—Effects of drought and diseases on wheat in Montana, by P. A. Young; flag smut survey in Illinois; root knot nematode population in New York reduced by cold winter, by A. G. Newhall; and die-back of camellia, by T. B. Post.

No. 9.—Look for the Dutch elm disease, by K. F. Kellerman; *Rhizoctonia bataticola* causing sore shin of tobacco in Kentucky; bacterial blight on native hazel in Oregon; and Zostera disease on the southern coast of Ireland.

[Plant disease investigations in Georgia] (*Georgia Sta. Rpt. 1933–34, pp. 26–29*).—Brief résumés are given of investigations on peach winter injury, peach rosette, breeding peanuts for disease resistance, peanut seed treatment, pepper fruit rots, control of tomato diseases in the seed bed, tomato wilt, and watermelon wilt.

Plant pathology and physiology (*Texas Sta. Rpt. 1933, pp. 70–98, 114, 115, 159, 160, 162–166, 225–228, 229*).—Results are noted of studies on cotton root rot, by J. J. Taubenhaus, W. N. Ezekiel, L. E. Brooks, J. F. Fudge, L. D. Christenson, and W. R. Horlacher (pp. 70–83); tomato puffing and diseases of

the Mexican tomato, by Taubenhaus and Ezekiel (p. 83); spinach yellows, by Taubenhaus, Ezekiel, and L. R. Hawthorn (p. 84); sulfur as a fungicide, by Taubenhaus and Hawthorn (pp. 84–86); micro-organisms of moldy feeds, by Taubenhaus (p. 86); leaf and stem blight of conifers; a disease of Douglas fir trees in transit; cotoneaster twig blight; decay of wooden building material; a new fruit rot of Japanese and native persimmons; peach mosaic; stem-end rot of watermelons; testing Iowa wilt-resistant watermelons in Texas; a new gray rot of cucumbers; leaf temperatures of cotton plants with *Fusarium* wilt; effect of insects and other animal organisms on the survival of the causative organism of cotton wilt, *Fusarium vasinfectum*; new wilt of cotton; a destructive disease of the faba bean; dry rot of ornamental cacti; chlorosis of eggplants; black rot of watermelons; and other diseases not previously reported from Texas, all by Taubenhaus, Ezekiel, J. F. Rosborough, H. B. Parks, Christensen, and Hawthorn (pp. 86–92); pyrethrum (attacked by cotton root rot), by Parks and S. H. Yarnell (pp. 114, 115) seed treatments (for cotton), by H. Dunlavy (pp. 159, 160), and cotton root rot investigations at Temple, in cooperation with the U.S.D.A. Bureaus of Chemistry and Soils and Plant Industry, by S. E. Wolff, H. E. Rea, and C. H. Rogers (pp. 162–166); cotton root rot studies at Weslaco, by W. J. Bach (pp. 225–228), and at Iowa Park, by Brooks (p. 238).

Observations and studies conducted at the State Phytopathological Station during 1933 [trans. title], É. Marchal (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 3 (1934), No. 2, pp. 97–106; Dutch, Ger., Eng. abs., p. 106*).—This is a survey of the plant disease situation in Belgium in 1933, when the summer was warm and relatively dry. The 1933 phytopathological publications of the station are listed.

Report of the mycologist, T. Small (*Jersey Expt. Sta., Glenham, Trinity, Rpt., 1933, pp. 30–48*).—This report includes the results of potato blight investigations which showed that tubers harvested from potato fields attacked by *Phytophthora infestans* were considerably protected against infection by formaldehyde treatment immediately after digging. Cutting the potato vines in dry weather several days ahead of digging also resulted in reduced tuber infection. Spores of the disease remained alive in the soil in a greenhouse as long as a week, and out of doors in February as long as 17 days. Temperatures as low as 29° F. failed to kill spores on exposed foliage. Spores washed into the soil by water attacked tubers lying 1.5 in. beneath the surface. It is believed that the disease winters over on the Isle of Jersey in an active condition on volunteer plants, since such were found attacked outdoors in January and February. Copper sprays successfully controlled the disease in the field.

Notes are also given on the following diseases: Late blight of tomatoes; stem canker of tomato (*Didymella lycopersici*), which was not controlled by bluestone-caustic soda spraying; blotchy ripening and greenback of tomatoes, believed to be due to nutritional deficiency and excessive sunshine, respectively; root knot nematode; and daffodil disease (*Botrytis polyblastis*).

Report of the imperial mycologist, W. McRae (*Imp. Inst. Agr. Res., Pusa, Sci. Rpts., 1931–32, pp. 129–140*).—Progress is reported on studies of diseases of pigeonpea (*Cajanus indicus*), *Dolichos lablab*, sugarcane, *Hibiscus sabdariffa*, rice, gram, *Piper betel*, cinchona, tobacco, wheat, barley, chilies, and of studies on sclerotia. *Synchytrium* sp. on *Trichosanthes dioica* and *Sclerotium sclerotiorum* on *Helianthus annuus* are reported for the first time in Pusa.

The relative influence of calcium and magnesium in Bordeaux mixture on the transpiration rate, I, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 169 (1934), pp. 158–163*).—Continuing studies already reported

(E.S.R., 71, p. 649) and comparing the rate of moisture loss from growing potted plants and from cut-off leafy shoots when sprayed with Bordeaux mixtures made with limes containing various proportions of Ca and Mg, the authors found that $Mg(OH)_2$ used in the spray consistently increases the transpiration rate of sprayed foliage somewhat less than does $Ca(OH)_2$. They also find that since there is more Ca than Mg, even in the high-Mg limes, there would be nearly as great increase in transpiration rate where such limes are used in a 4-6-50 Bordeaux mixture as where a high-Ca lime is used.

A method of recording the distribution of copper dusts or sprays on leaves, F. M. BLODGETT and E. O. MADER (*Phytopathology, 24 (1934), No. 4, pp. 418-422, fig. 1*).—A method is described for making permanent prints from leaves sprayed with Bordeaux mixture on paper specially prepared by moistening it with a solution consisting of 2 g of potassium ferrocyanide and 5 cc of acetic acid in 100 cc of water. When leaves sprayed with Bordeaux mixture are placed in press between two sheets of this paper, the copper on the leaves reacts with the potassium ferrocyanide to form a brown precipitate which adheres to the paper, thus recording the size and shape of the Bordeaux mixture spots on the leaves. The sheets are then washed and dried to form a permanent record. Photographs and measurements from such prints are presented to show how they may be used in comparing different methods of spraying and dusting.

The association of Cercosporella herpotrichoides with the Festuca consociation, R. SPRAGUE (*Phytopathology, 24 (1934), No. 6, pp. 669-676, figs. 2*).—The *Cercosporella* foot rot in the Pacific Northwest occurs almost entirely in prairies that originally bore a *Festuca* sod-grass consociation. Indicator plants are *F. idahoensis* (dominant), bunch grass (*Agropyron* spp.), *Balsamorhiza* spp., *Delphinium menziesii*, *Lomatium triternatum* and *Lithospermum ruderale*.

Physiology and parasitology of the fungi generally referred to as Hypochnus sasakii Shirai, I, II, T. MATSUMOTO, W. YAMAMOTO, and S. HIRANE (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 4 (1932), No. 3, pp. 370-388, figs. 4; 5 (1933), No. 3, pp. 332-345, figs. 5*).—This fungus, one of the most destructive soil-inhibiting micro-organisms of Japan, attacks a large number of plants, including peanut, soybean, sweetpotato, rice, bean, sugarcane, and corn.

I. *Differentiation of the strains by means of hyphal fusion and culture in differential media.*—In order to learn something as to the relationships of the fungi which have been classified as *H. sasakii*, 17 strains from 12 different hosts were compared with each other, with a culture designated as *Rhizoctonia solani* from cotton roots in India, and with a strain of *R. solani* isolated from a potato tuber in Germany.

The authors' conclusions, from a study of cultural characteristics and hyphal fusions, are that, although individual isolates can often be consistently distinguished from each other in culture, the separation into varieties is unwarranted, notwithstanding that a few strains are rather distinct from the rest. All the forms worked with perform either perfect or imperfect hyphal fusions with all other forms except with *R. solani* from Germany. This latter is considered a distinct species from *H. sasakii* and also from *Sclerotium oryzae-sativae*, but the strain from cotton root from India is considered to belong to *H. sasakii* rather than to *R. solani*.

II. *Temperature and humidity relations.*—The 17 isolation strains noted above were also grouped by differences in temperature relations. The optimum temperature of all the strains of this type lies within the range of 28°-32° C.,

in all probability at 28° or thereabouts, and the maximum and minimum may be 37° and 18°, respectively.

The causal fungus of potato black scurf (*Rhizoctonia solani*) is distinguished from the authors' strains in temperature relations, but the Indian strain from cotton seedlings and the causal fungus of "banded sclerotial disease of sugarcane" occurring in India are closely related to them.

Some factors influencing germination of spores of Phyllosticta solitaria, I. A. Burgert (*Phytopathology, 24 (1934), No. 4, pp. 384–396*).—Spores of *P. solitaria* taken from culture (at least 4 weeks old) showed good germination at the end of 24 hr. after sowing in distilled water, but higher counts were obtained on the second day. The minimum, optimum, and maximum temperatures for spore germination (using percentage germination and average germ tube length as a measure of viability) were found to be 5°, 21°–23°, and 39° C., respectively. Spores from pycnidia in bark cankers had the same temperature requirements but showed consistently lower germination. Bark decoction and potato dextrose broth, as compared with distilled water, caused an increase in spore germination. The Coons solution gave a slight increase, and tap water, rain water, apple fruit juice, and K.U. solution had an inhibitory effect. Of the various tissues placed near the germination drop, bark tissue acted as a stimulant, apple bark being most effective. Orange tissue, onion scale and shoot, and apple fruit tissue were somewhat inhibitory. Spore germination was not appreciably affected by light. There is a short interval between morphological and physiological maturity of spores formed in culture. Best germination was obtained when spores were from 10 days to 2 weeks old.

A procedure for inducing the production of the sporangial and swarm stages in certain species of Phytophthora, H. S. Fawcett and L. J. Klotz (*Phytopathology, 24 (1934), No. 6, pp. 693, 694*).—According to this contribution from the California Citrus Experiment Station, the fungus is grown in weak prune juice somewhat below its optimum temperature for from 10 days to 2 weeks. It is then transferred to Petri dishes with only enough sterile tap water partially to submerge the mass of mycelium. After large numbers of sporangia form (favored by light in the case of *P. citrophthora*), sudden exposure to the two following temperatures brings about swarming of the zoospores in large numbers. The dishes are first floated in water at from 28° to 30° C. for from 3 to 5 min. and then in water at from 15° to 18° until rapid swarming is produced. The swarming usually begins in from 15 to 20 min. and may continue to increase up to 1 hr. or more. At 20° *P. citrophthora* spores may retain their motility for from 45 to 90 min. The procedure was successful for *P. citrophthora*, *P. parasitica*, and *P. cactorum*.—(*Courtesy Biol. Abs.*)

Host specialization of Puccinia sorghi, E. B. Mains (*Phytopathology, 24 (1934), No. 4, pp. 405–411*).—Eight collections of telia from Indiana and Iowa were used to inoculate 16 species of *Oxalis*. Pycnia and aecia were produced on *O. corniculata* and *O. europea*. Pycnia and a few aecia developed on *O. cernua* and *O. stricta*. Pycnia rarely developed on *O. bipartita* and *O. valdiviensis*. Negative results were obtained with *O. articulata*, *O. brasiliensis*, *O. carnosa*, *O. crassipes*, *O. deppei*, *O. filipes*, *O. floribunda*, *O. lasiandra*, *O. latifolia*, and *O. violacea*. Only two of the collections produced aecia on *O. europea*, indicating a separation of the species into at least two races on the basis of host specialization. It is suggested that the negative results with *O. filipes*, *O. stricta*, and *violacea* may indicate other races. No correlation was noted between the races differentiated by *O. europea* and physiologic forms distinguished by maize varieties. Inoculations on *Zea mays* and *Euchlaena mexicana* produced uredinia. Inoculations of *Andropogon furcatus*, *A. scoparius*,

Coix lachryma-jobi, *Erianthus divaricatus*, *Holcus sorghum*, *Tripsacum dactyloides*, and *Sorghastrum nutans* gave negative results. It is suggested that the *Andropogon* rust with aecia on species of *Oxalis*, which has been placed by J. C. Arthur and F. D. Fromme in *P. sorghi*, should be considered a race of *P. andropogonis*.

Sclerotium rolfsii Sacc. in perfect stage.—I, Some correlation between sporation and cultural characteristics, K. Goto. (*Formosa* [*Taiwan*] *Nat. Hist. Soc. Trans.*, *23* (*1933*), *Nos. 124*, *pp. 37–43*, *fig. 1*; *125*, *pp. 75–90*, *figs. 2*).—Culture studies are recorded with 38 Asiatic and 7 American strains of supposed *S. rolfsii* isolated from over 20 different species of plants. Potato, onion, apricot, and carrot agars were used. Onion agar was the best for the production of the perfect stage. These isolates were separated by the investigator into 4 groups. Group 1 readily formed spores, group 2 formed spores to some extent, group 3 hardly formed spores in any case, and group 4 produced no spores whatever. Spore formation was correlated to a considerable extent with other growth characteristics, such as the mycelial characters, characters of sclerotium formation, growth rate, color, etc. The American strains did not differ much from the Asiatic members of groups 1 and 2, with a single exception.

It is concluded that groups 1 and 2 are properly referable to *S. rolfsii*.

Sclerotium rolfsii Sacc. in perfect stage.—II, Studies on S. rolfsii of foreign origin in comparison with some strains of Formosa, K. Goto (*Jour. Soc. Trop. Agr.* (*Nettai Nôgaku Kwaishi*), *5* (*1933*), *No. 4*, *pp. 374–382*, *figs. 2*).—Comparative studies were made of 80 strains of *S. rolfsii* from other countries, as well as from Japanese localities outside of Taiwan (Formosa), and of 7 Formosan strains of *S. delphinii* used as control. According to their sporulating nature, these "foreign" strains could be separated into 3 groups in accord with those described in the previous paper. Group 4, including most of the strains from India, differed somewhat from the group 4 mentioned in the previous paper, rather resembling R 25 in some respects. It was confirmed that there exists a certain correlation between sporulating nature and some biological characters, such as amount, size, variation in size, shape of sclerotia, etc.

All but one of the strains of *S. rolfsii* from the United States are included in groups 1 and 2, which are characterized by *Corticium*-type hymenia. Likewise, some strains received from J. F. Dastur, K. Nakata, et al., are also included in groups 1 and 2, which are considered to be widely distributed over the world, particularly in tropical to warm temperate regions, inasmuch as representatives were obtained from Taiwan (Formosa), China, the Philippines, India, North America, Africa, and Europe. It is concluded that the members of groups 1 and 2 are most closely related to *S. rolfsii* of American origin and may be properly referred to as *S. rolfsii* proper, though M. Curzi asserted that they are not true *S. rolfsii*. In all probability, according to the author, any strains resembling this type may be able to produce the perfect stage on onion culture media sooner or later.

Methods for determining sex differences in Sphacelotheca sorghi, L. J. Tyler (*Phytopathology*, *24* (*1934*), *No. 6*, *pp. 691–693*, *fig. 1*).—The author describes four methods for determining sex in monosporidial lines of *S. sorghi*: (1) Chlamydospore production in hypodermically inoculated plants, (2) chlorosis of vegetative parts of similarly inoculated plants, (3) sporidial fusions on agar smears, and (4) the production of a cottony mycelium which appears only when a colony is mixed with another of opposite sex on a suitable medium, such as slightly alkaline malt agar. The latter, the Hanch method, is the most expedient to use.

Variation in hyphal-tip cultures from conidia of Helminthosporium gramineum, H. L. Shands and J. G. Dickson (*Phytopathology, 24 (1934), No. 5, pp. 559, 560*).—According to this contribution from the Wisconsin Experiment Station, from 2 to 5 hyphal-tip isolates were obtained from each of 25 conidia and studied for cultural characters and pathogenicity. Different isolates from the same spore reacted differently in culture and ranged from nonpathogenic to highly pathogenic when seed inoculations were made on barley. Stripe symptoms produced by inoculation with different cultures from the same spore varied from characteristic leaf lesions on plants of full height to dwarfing and rosetting of the host. The multinucleate condition prevalent in the conidium and mycelium suggests that heterocaryosis may exist, which might explain variations found in cultures from the same conidium.—(*Courtesy Biol. Abs.*)

Effect of light on the development of the uredial stage of Puccinia glumarum, W. M. Bever (*Phytopathology, 24 (1934), No. 5, pp. 507–516, figs. 3*).—In this work undertaken cooperatively by the Idaho Experiment Station and the U.S.D.A. Bureau of Plant Industry, 6-in. pots containing 5 plants each of Pannier barley, C.I. No. 1330, were inoculated with *P. glumarum*. The inoculated plants in 7 sets of 5 pots each were exposed in a small room, with temperature controlled at from 45° to 50° F., to 6, 8, 10, 12, 15, and 24 hr. of light, respectively, per day furnished by three ordinary Mazda 200-w and two 100-w bulbs.

The shorter light exposure increased the incubation period from 9 to 11 days, but did not affect the type of host response. Fifteen-hr. per day exposure and continuous light exposure changed the response from the susceptible type (type 4) to the resistant type (type 0). Varying the light intensity from 960 to 96 foot-candles with 9-hr. daily exposure did not have any effect on type of host response, but the period of incubation was reduced as the light intensity increased.

Good infection resulted when plants were inoculated with urediospores developed under a low light intensity (96 foot-candles), but such spores did not germinate in water cultures. There was no difference in results from inoculation tests conducted at from 45° to 50° and at from 55° to 60°. At from 68° to 70°, however, the type of response was changed from type 4 to type 2 or 3 (less susceptible). No infection was obtained at 80° or above.

Physiologic forms of Puccinia graminis tritici in Kwangtung, southern China, C. Tu (*Phytopathology, 24 (1934), No. 4, pp. 423, 424*).—The author states that black stem rust of wheat (*P. graminis tritici*) is the most destructive disease of wheat in Kwangtung Province, southern China, and is becoming a limiting factor in profitable wheat growing. As the alternate host does not seem to be important, the only possibility of control is by dusting or by producing disease-resistant varieties. At present dusting is not practicable.

Preliminary to breeding work, a physiologic form survey was made. The author found 6 forms, of which 1 and 2 correspond with forms 15 and 9, respectively, as described by Stakman and Levine (E.S.R., 48, p. 346), while the other 4 appear to be entirely new.

Relation of barberry to the origin and persistence of physiologic forms of Puccinia graminis, E. C. Stakman, M. N. Levine, R. U. Cotter, and L. Hines (*Jour. Agr. Res. [U.S.], 48 (1934), No. 11, pp. 953–969, figs. 8*).—In cooperative investigations between the Minnesota Experiment Station and the U.S.D.A. Bureau of Plant Industry from 1919 to 1932, "inoculations were made on the common small grains with material from 675 aecial collections of *P. graminis* obtained from the northern part of the United States. Of these, 281

caused infection, 34.2 percent being of the *tritici* variety, 63.7 percent of the *secalis* variety, and only 2.1 percent of the *avenae* variety.

"The relative prevalence of the different varieties of *P. graminis* probably is governed to a considerable extent by the distribution of wild grasses susceptible to the different varieties.

"The varietal identity of 138 uredial collections of *P. graminis* obtained within 100 yd. of rusted barberries also was determined, with the following percentages: *tritici*, 52.2 percent; *secalis*, 32.6 percent; and *avenae*, 15.2 percent. These percentages probably were affected by a certain amount of conscious selection of hosts known to be susceptible to certain rust varieties.

"The results given above, supplemented by other observations, indicate that stem rust of rye (*P. graminis secalis*) is almost wholly dependent on barberries for its persistence in the United States.

"From 94 aecial collections of *P. graminis tritici*, 26 physiologic forms were isolated, a different form from approximately every 4 collections, whereas from about 8,000 uredial collections made at random over a period of years a different form was isolated from about every 100 collections.

"Of the physiologic forms isolated from *P. graminis tritici*, forms 36 and 38 were the most prevalent.

"Four forms (62, 102, 104, and 105) never have been isolated from any source other than rusted barberries. Forms 61 and 66 were isolated first from rusted barberries but subsequently were isolated from rusted wheat also.

"From 71 uredial collections of *P. graminis tritici* made near rusted barberries, 19 physiologic forms were obtained, one of which (form 48) never has been found elsewhere in the United States, although reported several times from Canada.

"The results indicate that barberries in nature are responsible for the production of new physiologic forms of *P. graminis tritici*, as well as for the persistence of numerous forms.

"Twenty-seven aecial collections of *P. graminis secalis* comprised 9 physiologic forms, and 28 uredial collections obtained near rusted bushes comprised 8 forms, a far larger number in proportion to the number of collections than in the case of uredial collections made at random. Forms 7 and 11 were the most prevalent, form 5 has been obtained only from aecia or uredia formed near infected barberries, and form 14 was isolated only from aecial collections or was the product of 'selfing' on barberry.

"Only 6 aecial collections of *P. graminis avenae* were identified, forms 2 and 5, which are widely distributed in the United States, being isolated. A new form (10), however, was isolated from oats near rusted barberries. It is far more virulent on the Richland group of oat varieties than either of the other two forms mentioned.

"When barberries were inoculated with telial material in the greenhouse, the ratio between the number of forms isolated and the number of telial collections used for inoculating was 2 to 5. For example, 17 forms were isolated from 30 cultures of *P. graminis tritici* and 6 forms from 29 cultures of *P. graminis secalis*.

"Forms 67, 96, and 127 of *P. graminis tritici*, isolated as a result of inoculating barberries with teliospores, never have been obtained from uredial material in the field, and another form (101) has never been found in the United States except on artificially inoculated barberries, although it was isolated from uredial material collected in Bulgaria.

"Two physiologic forms (4 and 14) of *P. graminis secalis* were isolated from artificially inoculated barberries and from naturally infected bushes in the field, but form 14 has never been isolated from uredial material.

"It is concluded that in nature barberries are important in the production and persistence of physiologic forms and in the persistence of certain varieties of rust, especially *P. graminis secalis* and probably *P. graminis agrostidis* and *P. graminis poae* also."

Temperature studies on stripe of barley, H. L. SHANDS (*Phytopathology, 24* (*1934*), *No. 4, pp. 364–383, figs. 2*).—The optimum temperature for mycelial growth of *Helminthosporium gramineum* on potato dextrose agar was found to be near 25° C., with a maximum above 32° and a minimum considerably below 8°. Floral inoculations were made by spraying a conidial suspension on flowers that had been enclosed within glassine bags. Seed inoculations were made by (1) placing seed between layers of potato dextrose agar on which the fungus was growing and (2) by incubating seed that had been placed in contact with mycelium growing on autoclaved wheat kernels. Generally speaking, the lower temperatures induced the greatest percentage of striping when time was left out of consideration. The lower temperatures required longer for striping, which did not permit the definition of a clear-cut optimum. After inoculated seeds were planted, change in temperature from low to high stimulated disease appearance, while the opposite change retarded disease expression. The final percentages of stripe were not greatly altered. The greatest percentage of stripe developed at the lower temperatures when inoculated seedlings were incubated until reaching the same stage of development at the several temperatures. When inoculated seedlings were incubated for 4 days at all temperatures, the highest percentage of disease occurred at 20°.

Abnormal germination in dusted wheat, W. CROSIER (*Phytopathology, 24* (*1934*), *No. 5, pp. 544–547, fig. 1*).—This contribution from the New York State Experiment Station reports that when Marquis spring wheat dusted with Ceresan in March 1931, according to presumably standard procedure, was germinated 16 mo. later in routine laboratory tests, only 49 percent of the seeds on the average produced normal seedlings, while 13 percent produced nearly normal plumules, but short thickened roots, 34 percent produced very abnormal plumules and roots, and 4 percent were dead. Other similarly treated seed germinated normally. Washing this seed in water or brushing off the dust deposits did not increase normal germination. Poor field stands were recorded.

Examination of this seed revealed chipping or cracking of the seed coats. Seed experimentally cracked and liberally dusted with Ceresan germinated normally after 3 months' storage, but seed dusted while damp germinated very poorly at the end of this time. Need for further study of the factors responsible for treatment injury is pointed out.

Increase of kernel weight in common wheat due to black-point disease, L. R. WALDRON (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 11, pp. 1017–1024*).—A heavy infection of black point, caused largely by *Helminthosporium sativum* was found on various common wheats at the North Dakota Experiment Station in 1933. On any one plant, in the hybrids studied, the black point kernels generally were definitely heavier than the kernels showing no evidences of infection. This difference in weight can be ascribed in part to the fact that third-floret kernels and end-spike kernels carried less infection than the heavier mid-spike kernels. Within any kernel group of the spike, such as the third floret group, the black point kernels were significantly heavier than the noninfected kernels. The author points to the possibility that a portion of the weight differences results from a stimulation of the development of the endosperm following the entrance of the fungus into the developing ovule.

The development of rusts on wheat [trans. title], E. C[illegible] (*Riv. Pat. Veg., 25* (*1935*), *No. 1–2, pp. 17–25*).—Of the wheat rusts *Puccinia triticina*

appeared a few days earlier than *P. graminis* in 1929, 1930, and 1931, but *P. graminis* soon forged ahead, especially in 1929, and became epidemic, while *P. triticina* was arrested in development. In 1929, when the season was cold and late, the rust was also late. While the variety of wheat Mentana is considered more or less resistant and certainly superior in this respect to Gentil Rosso, on June 6, 1929, Mentana (early and more advanced in growth), surrounded on opposite sides by Gentil Rosso, was already showing numerous uredospore pustules, while the Gentil Rosso was still undamaged. The weather conditions for June 1929, given in considerable detail in connection with rust infections, were favorable when the temperature was high (22°–26° C.) and moisture abundant. In 1930 only the aecidium stage was found on *Berberis vulgaris*. Attempts to germinate teleutospores failed. Uredospores on wild hosts survived temperatures down to −15° for 15 hr. with reduced germination.—(*Courtesy Biol. Abs.*)

Factors affecting the severity of take-all.—III, The climatic factor, S. D. Garrett (*Jour. Dept. Agr. So. Aust., 37 (1934), No. 8, pp. 976–983, figs. 2*).—This reports a continuation of studies already cited (E.S.R., 71, p. 333).

The various ways in which weather may affect the prevalence of take-all are discussed under the headings Dispersal Over Noninfected Ground, Survival of Mycelium in the Soil, Rate of Spread Through the Soil, Growth of the Fungus on Infected Plants, and Past Records of the Prevalence of Take-all.

The results of an investigation into the occurrence of take-all in South Australia during the years from 1900 to 1933 show that epidemics occurred only in years characterized by a comparatively high spring rainfall. The possible relation of this to the occurrence of wind-borne ascospore infection on the lighter soils is discussed.

Further observations on the natural distribution of the cotton root-rot fungus, C. J. King, C. Hope, and E. D. Eaton (*Phytopathology, 24 (1934), No. 5, pp. 551–553, fig. 1*).—As indicated in a previous report (E.S.R., 66, p. 837), the cotton root rot fungus (*Phymatotrichum omnivorum*) occurs naturally in widely separated parts of the desert region of the southwestern United States. In recent years it has been found to be indigenous in the drainage basins of the Rio Grande, Gila, and Colorado Rivers. It is known to extend as far north as southern Utah and as far south as Sonora and Lower California. Desert plants are not often killed by the fungus, and infestations are discovered only by the chance find of a dead plant or spore mats which sometimes appear on the surface of the ground in wet weather. On new lands infection frequently carries over from native plants, such as mesquite and *Lycium*, to the cultivated plants.

Infestations in cultivated and virgin lands of the desert region frequently follow irrigation and drainage channels and in some cases may be traced to the headwaters of the irrigation streams. Sclerotia and infested driftwood transported by water from the watershed areas may account for the fact that relatively greater infestations have been found on lands irrigated for many years with silt-laden flood waters than on newer lands.—(*Courtesy Biol. Abs.*)

Control of cotton wilt and "rust", *J. O. Ware* and *V. H. Young* (*Arkansas Sta. Bul. 308 (1934), pp. 23*).—Tests in 1932 and 1933, the latter year being particularly favorable to cotton wilt, confirmed the results of earlier work (E.S.R., 67, p. 547) as to the relative resistance of the tested cotton varieties under Arkansas conditions to *Fusarium vasinfectum*, and pointed out the value of many of the newer strains developed in Arkansas and elsewhere. The amount of wilt observed in the varieties under test in 1931, 1932, and 1933 is given. No correlation appeared between relative wilt resistance and any eco-

nomic varietal characters, such as earliness, lint percentage, staple length, or boll size.

Fertilizer studies indicated that sufficient amounts of muriate of potash or kainit to control "rust" (potash hunger) greatly reduce the incidence of cotton wilt also. Appropriate amounts of N and P must be combined with the K, however, to insure adequate yields. Stable manure at 10 tons per acre relieved potash hunger and gave high yields, but was only slightly effective in cotton-wilt control.

Further work is held needed, but the indications are that the best program for the farmer will combine the use of a commercially desirable wilt-resistant variety of cotton with the application of a mixed fertilizer carrying K enough to prevent "rust."

Verticillium wilt of cotton in Greece, L. E. Miles (*Phytopathology, 24 (1934), No. 5, pp. 558, 559*).—J. A. Sarejanni, plant pathologist at the Institut Phytopathologique Benaki, Kiphissia-Athēnai (Athens), Greece, reported to the author the occurrence of cotton wilt caused by *V. alboatrum* in Greece from both Macedonia and continental Greece. Cultures received from four localities in Greece proved very similar in growth characters and morphological details to those isolated at the Mississippi Experiment Station from cotton in that State. Sarejanni reports the disease as occurring only on cotton of American varieties from seed imported from America in 1932 and 1933. He assumes, therefore, that the disease was introduced on such seed. The author, however, suggests the possibility that the fungus may be indigenous to Greece on some other host plant and that the American varieties of cotton have proved very susceptible under Grecian climatic conditions, whereas the varieties commonly grown in Greece may be immune or highly resistant.—(*Courtesy Biol. Abs.*)

Crown gall of hops, G. R. Hoerner (*Phytopathology, 24 (1934), No. 6, pp. 688–691, fig. 1*).—Although generally distributed in hopyards in California, Oregon, and Washington, the disease is not considered of major economic importance. A bacterial organism, presumably *Phytomonas tumefaciens*, isolated from hop galls, upon inoculation caused typical galls on previously healthy plants.

Elimination of potato late blight from North America, D. Reddick (*Phytopathology, 24 (1934), No. 5, pp. 555–557*).—According to this contribution from the [New York] Cornell Experiment Station in cooperation with the U.S.D.A. Bureau of Plant Industry, the following species of *Solanum* are known to be immune from late blight caused by *Phytophthora infestans: S. ajuscoense, S. antipoviczii, S. bulbocastanum, S. coyoacanum, S. demissum, S. neoantipoviczii, S. polyadenium, S. sambucinum*, and *S. verrucosum* (in part). *S. demissum*, in particular, has been hybridized with domesticated sorts. At Ithaca it has yielded very few seeds as male parent, but abundant seeds as female parent. F_1 plants were 90 percent immune to blight. F_2 plants with *S. demissum* as female parent revert to the wild type and are immunes. Back-crosses were 68 percent immune, and the immunes showed some characters of the domestic varieties. A second back-cross yielded 50 percent immune plants, and of these a certain number were like cultivated varieties as to yield, date of maturity, length of stolon, shape, color, and size of tuber. The possibility of eliminating this disease from North America seems to the author real, assuming that distinct biotypes of *P. infestans* do not occur on this continent.—(*Courtesy Biol. Abs.*)

A survey of potato scab and Fusarium wilt in western Nebraska, R. W. Goss (*Phytopathology, 24 (1934), No. 5, pp. 517–527*).—According to this report from the Nebraska Experiment Station, a survey of scab and *Fusarium* wilt

in the high plains area of western Nebraska revealed that when portions of a 100-bu. lot of treated seed potatoes were planted on each of 100 farms there were no fields entirely free from scab. The average percentage of scab infection was 24.4 percent, with an additional 30 percent of a superficial or russet type of scab. Ninety-four percent of the fields produced tubers with stem-end rot or vascular discoloration, the average being 4.5 percent. The following factors were correlated with a high percentage of scab: Cultivated crops or summer fallow the preceding year as contrasted with small grains, an interval of less than 4 yr. between potato crops, decreasing pH values of the soil from 8.25 to 5.92, early planting, silt loam soils as contrasted with loams or very fine sandy loams, and high number and percentages of *Actinomyces* in the soil. There was no correlation between any of the factors recorded and the occurrence of *Fusarium* wilt.—(*Courtesy Biol. Abs.*)

Potato mosaic, wheat rust in autumn, and silver leaf of peaches [trans. title], E. Corneli (*Riv. Patol. Veg.*, *23* (*1933*), *No. 1-2*, *pp. 51, 52*).—Potato mosaic was observed in 1931 and 1932. Wheat plants were received from Bolognola in November 1932 showing uredospores and teleutospores of *Puccinia graminis*. In the same year silver leaf disease was observed on peaches at Foligno.—(*Courtesy Biol. Abs.*)

Studies on the red blotch of rice grains [*trans. title*], S. Ito and S. Iwadare (*Hokkaido Agr. Expt. Sta. Rpt.*, *31* (*1934*), *pp. 1-84+1-3*, *pls. 3*, *figs. 2*; *Eng. abs.*, *pp. 1-3*).—"Red blotch" (Kôhen-mei) is one of the most serious diseases of rice grains in Hokkaido. It is characterized by formation of pinkish red lesions on the hulled grains and sometimes on the glumes. The hardness and germinating power of the affected grains are very much reduced. The disease is distributed throughout Hokkaido, but is almost negligible in the other provinces. It is shown to be due to two species of *Epicoccum*, one identical with *E. neglectum*, and the other *E. oryzae*, described as a new species.

Both fungi are capable of affecting rice grains, hulled or unhulled, raw or steamed. They grew well at 19°-25° C., and above 25° growth decreased promptly. No growth occurred at 32°.

Infection occurs at a wide range of temperature and is rather vigorous at comparatively lower temperatures. None of the strains showed pathogenicity at 30°. These fungi appeared to be active at lower temperatures than other diseases of rice plants. *E. neglectum* was isolated from *Triticum vulgare*, *Avena sativa*, *Zea mays*, *Phaseolus vulgaris*, and *Fagopyrum vulgare*, and was able to attack rice grains but not healthy leaves and stems. The disease occurred severely when rice plants had fallen to the ground in the later period of growth, and when they were laid on the ground or bundles were stood upside down, with the ears touching the ground, for some days after harvesting. On the other hand, the disease was almost negligible when harvested plants were hung up and dried.

A leaf spot disease of soybean: A potassium deficiency phenomenon [trans. title], A. Kornfeld (*Ztschr. Pflanzenernähr., Düngung u. Bodenk.*, *32* (*1933*), *No. 3-4*, *A*, *pp. 201-221*, *figs. 7*).—Certain symptoms of injury were traced to potassium deficiency. These symptoms include the appearance on the leaves of irregular spots, at first yellow, later becoming brown, sometimes a browning of the veins, coloring of the stems, chlorosis, and weak stalks. The potassium content in all parts of the plants was 70-85 percent of that in healthy plants. In field trials with various combinations of potassium, phosphorus, and lime, the proportion of injured plants was several times greater where potassium was omitted. Data are given on seed weights, germination

tests, and plant vigor. Dead leaf cells were starch-free, but there was a high accumulation in neighboring cells and in the leaves of potassium-hungry plants, which seems to confirm the need for potassium in the translocation of carbohydrates.—(*Courtesy Biol. Abs.*)

Boron deficiency symptoms in sugar cane, J. P. Martin (*Hawaii. Planters' Rec., 38 (1934), No. 1, pp. 95–107, figs. 6*).—Boron deficiency symptoms were induced on five varieties of sugarcane grown in water cultures at pH 5.2, considered within the optimum pH range. The most marked effect of lack of boron was retardation of growth, leaf distortion, chlorosis in young leaves, and the presence of definite lesions on the leaves and within the stalks, followed quickly by death unless boron were restored. As little as 0.22 p.p.m. was sufficient for normal growth. The symptoms usually began to develop in from 1 to 2 mo. after boron was omitted. Photomicrographs illustrate the poor development of the hypodermal sclerenchyma above and below the bundle sheath, the great enlargement of certain sheath cells, and the necrosis and splitting in the intervascular leaf tissues.

An insect vector of the Fiji disease of sugar cane, G. O. Ocfemia (*Amer. Jour. Bot., 21 (1934), No. 3, pp. 113–120, pl. 1, figs. 2*).—It is concluded, from experiments conducted under controlled conditions, that the disease occurring in the Philippines is transmissible by adults of the leafhopper (*Perkinsiella vastatrix*). The incubation period was from 28 to 86 days. The first symptoms consisted in the appearance of small galls on the under surface of the leaves, followed by a shortening of the younger leaves.—(*Courtesy Biol. Abs.*)

Downy mildew of tobacco, F. A. Wolf, L. F. Dixon, R. McLean, and F. R. Darkis (*Phytopathology, 24 (1934), No. 4, pp. 337–363, figs. 8*).—This is an account of the life history and morphology of the fungus *Peronospora nicotianae*, of the sources of inoculum in spring in the flue-cured tobacco area, of the agencies of dissemination, of the pathology of the disease, and of the relation of weather conditions to development and spread. It attacks not only many species and varieties of *Nicotiana* but also tomato, pepper, and eggplant seedlings.

The germ tubes from sporangia enter by way of the stomata and will have formed a new crop of sporangia within from 4 to 7 days. Toxic water-soluble substances formed within the tissues aid in producing the death of the cells and are presumed to be a cause of the high mortality of seedlings when diseased plants are transplanted. Sporangia are air-borne, as determined by means of spore traps and by their occurrence, determined microscopically, on seedlings in beds that are distant from diseased seedlings. Moisture is necessary for the germination of sporangia, and short exposure to temperature of 84° F. destroys their viability, as also does direct sunlight.

Crops of sporangia are produced in the early morning with the advent of day. Temperatures from 50° to 60° are ideal for sporulation and for the dissemination and germination of sporangia, especially when rainy weather or continuously overcast skies prevail. A correlation of the weather with the occurrence of downy mildew has been established by means of continuous records of temperature and humidity, and by the fact that it has been possible to maintain the organism in "artificial" culture. Oospores form in decaying tissues, and evidence is presented of their importance in initiating the disease in the spring.

Suggested measures for control consist of the avoidance of old seed bed sites, sowing beds thinly, providing ample air and soil drainage, early removal of the covers, and artificial heating of the seed beds at critical times.

Studies of frenching of tobacco, P. E. Karraker and C. E. Bortner (*Kentucky Sta. Bul. 349 (1934), pp. 61–109, figs. 7*).—Studies of frenching of tobacco extending over several years are reported consisting mainly of: (1) Observation of frenching in plants in the field, involving various soils from within and without the bluegrass region, and in the greenhouses in soil and sand cultures where the lime and fertilizer treatments were known; (2) determination of nitrate and pH of soils where frenching developed; (3) production and control of frenching in plants growing in sand and soil (mainly in the greenhouse) with varying amounts of Ca, N, P, and K in different forms; and (4) applying to frenched parts of plants, solutions containing various elements including those found to give recovery from other chlorotic diseases.

Frenching did not develop with soils of moderate or strong acidity, irrespective of the supply of nutrients. With less acid soils, it developed when the amount of N, P, or K, singly or in combinations, available for plant use, was low, and did not develop with a high level of these nutrients in available form. Sufficient additions of these nutrients, also, brought about recovery of frenched plants.

Frenching developed in soils which ranged in pH from 5.8 up, many testing from 6.0 to 6.5. The effect of reaction on frenching appeared to be one of Ca supply, and mainly within the plant. While frenching was not observed in acid soils, it was not, usually, more common or severe in soils which had been heavily limed than in those only slightly acid.

It was often necessary to add a larger amount of N, P, or K to control frenching than to give satisfactory growth of unfrenched plants. In the greenhouse tests, deficiency of N appeared more clearly related to frenching than deficiency of P or K, although when one or both of the latter were deficient frenching often developed with much nitrate present. When soil reaction was favorable to frenching, a high available level for these three elements had to be maintained during growth to prevent it. In the field studies, while frenching appeared in some areas where deficiencies in one or more of these elements occurred, yet in a considerable number of areas frenching appeared where these elements were sufficiently abundant for satisfactory crop growth, making it appear that a higher level of nutrients may be required to prevent frenching than to promote normal plant growth.

The fact that frenching is a disease of the growing points of plants, primarily, suggested that it might be caused by slow translocation, perhaps, of simple protein compounds into the growing point. Ca at a high level might, it is suggested, by affecting mobility of the protein compounds and nutrient supply, enable normal growth to proceed when translocation is slow.

Frenching in plants in soil and river sand in the greenhouse was rather easily brought about by proper addition of pulverized limestone and adjustment of nutrient supply. It was more difficult to obtain frenching when acid-treated and washed white silica sand was used. Mg, S, Fe, Mn, Cu, Zn, and a number of other elements were not found to be related to frenching, in the work done.

That frenching is of toxic origin was considered improbable. The studies rather clearly show it to be related to soil reaction and nutrient supply, but it is considered that other, as yet unrecognized, causal factors may be present which reaction and nutrient factors merely suppress or bring into activity.

The host range and behavior of the ordinary tobacco-mosaic virus, T. J. Grant (*Phytopathology, 24 (1934), No. 4, pp. 311–336, figs. 5*).—The ordinary tobacco mosaic virus (tobacco virus 1) has, in recent years, generally been regarded as limited to the Solanaceae. Evidence has existed, however, that

this virus was transmissible to two genera outside this family. In order to obtain more complete information on host range in relation to both classification of viruses and the development of control measures, a systematic study was undertaken with widely separated plant species.

The experiments were conducted under greenhouse conditions favorable for the development of the virus, although often not particularly favorable for the best development of the host used. The wiping method of inoculation was used on all plants tested, and infection was verified by reinoculation to *Nicotiana tabacum* and *N. glutinosa*.

Over 2,000 plants representing 40 families, 104 genera, and 121 species were inoculated with the ordinary tobacco mosaic virus. No monocotyledonous plants tested were found susceptible. The following 29 dicotyledonous species representing 14 families were recognized as hosts for the virus: Buckwheat, garden and sugar beet, Swiss chard, spinach, New Zealand spinach, larkspur (*Delphinium consolida*), mustard (*Brassica alba*), turnip, bean (*Phaseolus vulgaris*), carrot, morning-glory, cypress vine (*Quamoclit pennata*), phlox, California bluebell (*Phacelia whitlavia, P. campanularia, P. grandiflora, P. tanacetifolia*, and *P. parryi*), Chinese forget-me-not (*Cynoglossum amabile*), mullein, Kenilworth ivy (*Linaria cymbalaria*), snapdragon, foxglove, Maryland figwort (*Scrophularia marylandica*), beardtongue (*Penstemon barbatus*), unicorn plant (*Martynia louisiana*), zinnia, French marigold, cape marigold, and tasselflower (*Emilia sagittata*).

The high percentage of infection secured (24 percent) among the species tested suggests that still other species in other families will prove susceptible on trial. Symptom expression in these nonsolanaceous plants was characterized by marked variations ranging from "masked" symptoms to typical chlorosis, mottling, malformation, necrosis, and stunting, alone or in combination.

The distribution of the virus in these plants varied from typical systemic infection to localized infection and erratic spread from the inoculated portion. On the whole, the species reported are not highly susceptible, but the variation in behavior in this respect is apparently not much greater than that which may be found in the Solanaceae.

A study of the properties of the virus from different host species shows that its reaction to thermal death point, tolerance to dilution, and aging in vitro tests was not radically influenced by the host in which it developed. The presence of characteristic cell inclusions in infected nonsolanaceous hosts, such as *Phacelia whitlavia*, larkspur, Kenilworth ivy, spinach, and Maryland figwort, adds support to the accumulating data on the specificity and stability of this and other plant viruses under varying conditions. While it has been found, to be sure, that the virus may be attenuated by certain of the new host species, e.g., French marigold, it is quite as certain that the majority of species have no such influence.

In the case of spinach infected with tobacco mosaic, the virus acted as though it existed only in very low concentration. Extract from this host, however, diluted 1 to 1,000 and 1 to 10,000 gave a greater number of local lesions on *N. glutinosa* than did the undiluted extract. Moreover, healthy spinach juice appeared to act deleteriously on virus extracts of high concentration from tobacco. Consequently, low percentages of infection secured from spinach and certain other species are believed not to be a result of low concentrations of the virus in such hosts.

Studies on acquired immunity with tobacco and aucuba mosaics, L. O. Kunkel (*Phytopathology, 24 (1934), No. 5, pp. 437-466, figs. 7*).—Cross-immunity studies with tobacco and aucuba mosaics on *Nicotiana sylvestris* have

shown that plants of this species infected with tobacco-mosaic virus become immune to aucuba mosaic except in very young leaves. Plants of this species infected with attenuated strains of either tobacco mosaic or aucuba mosaic acquire immunity to unattenuated aucuba-mosaic virus. Evidence that this immunity may be specific for viruses closely related to that of aucuba mosaic is brought by experiments showing that cucumber mosaic and the ring spot disease of tobacco give no protection against aucuba mosaic.—(*Courtesy Biol. Abs.*)

A new disease of tobacco seedlings [trans. title], J. C. s'Jacob (*Meded. Besoek. Proefsta.* [*Java*], *No. 50* (*1933*), *pp. 53–68, figs. 7; Eng. abs., pp. 60, 61*).—A disease of tobacco seedlings is described due to *Pythium aphanidermatum*. The fungus was isolated from the dead plants and cultivated. The disease is new for the east of Java and known only from Togaland and south India. A treatment with Bordeaux mixture was unsuccessful, leaving as the only method of treatment the heating of the soil. Different inoculation experiments were laid out with several other plants which are often found on tobacco seed beds when they are out of use. Positive results were obtained on *Tephrosia candida*, *Leucena glauca*, *Mimosa invisa*, *Amaranthus lividus*, and *Portulaca oleracea*, but on the last three only to a small extent. It is considered better not to use *Tephrosia* and *Leucena* as green manures on tobacco beds infected by *Pythium aphanidermatum*.

Some practical aspects of perennial canker control, E. L. Reeves (*Wash. State Hort. Assoc. Proc.*, *28* (*1932*), *pp. 76–81*).—This is a popular summary of the practical results of investigations by the Bureau of Plant Industry, U.S.D.A., in the Pacific Northwest. The devitalizing influence of winter injury is considered probably the most important factor in predisposing a tree to attacks. Since the canker organism appears to be more or less saprophytic in nature, it gains ready entrance to injured or dead bark and there makes its most rapid development. Spraying experiments conducted in the upper Wenatchee Valley showed that fruit rot caused by this fungus could be successfully reduced by applying 4–4–50 Bordeaux mixture before the fall rains. Pruning after March 1 is recommended as resulting in fewer infections than pruning during the fall or winter. Surgical treatment is advised for serious limb infections where the "top renewal system" does not appear to be fully practical. This work should be done preferably in June and July. All pruning wounds should be protected against attacks of woolly aphis to prevent reinfection in tissue injured by the insect.

Control of apple sooty blotch by May and June sprays, R. C. Baines (*Phytopathology*, *24* (*1934*), *No. 5, pp. 553–555*).—According to this contribution from the Indiana Experiment Station, *Gloeodes pomigena* was effectively controlled in 1928 and 1932 by wettable sulfur or Bordeaux mixture sprays applied before June 10 and 14, respectively. The date of the last spray application approximated the period of spore dissemination. Late summer sprays, therefore, appear to be needless.

Life history of the hairy-root organism in relation to its pathogenesis on nursery apple trees, E. M. Hildebrand (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 10, pp. 857–885, figs. 5*).—In studies of infectious hairy root conducted cooperatively by the U.S.D.A. Bureau of Plant Industry and the Wisconsin Experiment Station, the differentiation of hairy root from crown gall and from wound overgrowth has been repeated and confirmed. The entrance of the bacteria into the host plants was found to be accomplished only through wounds. The type of wound apparently made no difference in the kind of overgrowths, but, as compared with larger wounds, needle punctures showed a

slightly longer incubation period, a smaller percentage of resulting infections, and smaller reactions. Extremely shallow wounds were poor infection courts. Wounds on the underground stems of nursery apple trees remained open for infection for about two days. Callus was found ordinarily to be a barrier against the invasion of the bacteria, and shallow wounding of callus only occasionally resulted in infection. Certain insects (*Phyllophaga* sp., *Elateridae* sp., and *Mycetophilidae* sp.) appeared important in producing injuries that lead to infection. The hairy root bacteria were isolated from white grubs (*Phyllophaga* sp.).

Neither the time of the growing season nor the age of the nursery apple trees seemed to influence susceptibility. Varietal susceptibility differed widely, ranging from 12 to 100 percent for the 29 varieties studied in 1930, and from 22 to 100 percent for the 37 varieties studied in 1931. Previous infection apparently did not prevent subsequent infection.

The hairy root organism appeared to begin its relations with the host tissues in the liquid released by the wounds. The bacteria were observed in the intercellular spaces in Paris daisy and apple stems. Their presence between the cells stimulated cell multiplication and the formation of somewhat circular areas of hyperplasia. The bacteria were isolated from the surface and subsurface parenchymatous tissues of the enlargements, were found to be abundant on the surface of the enlargements, and were found often in the soil near the hairy root formations. The bacteria overwintered in soil kept either in the field or with nursery stock in the storage cellar. The longevity of the bacteria in field soil which had been steamed or left untreated was found to exceed 1 yr. The bacteria may be spread long distances by shipments of nursery stock. The seedling root was found to be one medium of transmission of the causal organism from one crop to the next.

Seasonal development of hairy root, crown gall, and wound overgrowth on apple trees in the nursery, A. J. Riker and E. M. Hildebrand (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 10*, *pp. 887–912*, *figs. 8*).—In these cooperative investigations between the Wisconsin Experiment Station and the U.S.D.A. Bureau of Plant Industry, the seasonal development of hairy root, crown gall, and wound overgrowth on nursery apple trees was followed during the widely different growing seasons of 1929, 1930, and 1931 in Kansas. Crown gall, caused by *Phytomonas tumefaciens*, and hairy root, caused by *P. rhizogenes*, were induced by wound inoculations with single-cell cultures of the causal organism; and wound overgrowths, by wire girdles and knife cuts. Successive stages in the development of these several overgrowths, which assist in their characterization and differentiation, are described and illustrated.

Records were made and correlated of various meteorologic factors, growth of the trees, incubation periods following inoculations, occurrence of natural infection, and insect relations. The incubation periods of crown gall and hairy root were both shorter in the summer than in either the spring or fall. Adhesive tape wrappers at the unions of inoculated piece root apple grafts delayed only slightly the appearance of infection. After the grafts were planted, this wrapper protected the union against root-chewing insects and from external natural infection so long as it remained intact.

Various mixtures of overgrowths appeared, especially on second-year trees. Crown gall was of minor importance. Only a relatively small amount of hairy root infection occurred at grafting time, but it was probably important as a source of inoculum for subsequent natural infections which often increased progressively in number with the age of the planting. The available evidence

points to soil insects, including white grubs, wireworms, and fungus gnats, as important agents in opening infection courts for hairy root bacteria.

Hairy root, crown gall, and other malformations at the unions of piece-root-grafted apple trees and their control, A. J. RIKER, G. W. KEITT, E. M. HILDEBRAND, and W. M. BANFIELD (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 10*, *pp. 913–939*, *figs. 2*).—Trials made in cooperative studies between the Wisconsin Experiment Station and the U.S.D.A. Bureau of Plant Industry during 7 yr. in 7 midwestern States on many varieties of apples have been summarized. Trees with infectious hairy root (*Phytomonas rhizogenes*) made, on an average, slightly less growth than normal, smooth trees. Infectious hairy root kept the trees alive when all other roots were removed.

Most of the naturally occurring overgrowths appeared at or near the union. Their control presented a complex problem because of the several factors involved. Relatively little crown gall (*P. tumefaciens*) was found. Wound overgrowth in some sections frequently either healed over or became infected during the second or later years by hairy root bacteria. Various kinds and degrees of mixtures of different overgrowths were found. There often appeared to be a correlation between the percentage of overgrowths and the length of time the trees remained in the nursery row.

A relatively few cases indicated high percentages of hairy root infection at grafting time. In such cases, hairy root bacteria were doubtless carried on the seedling roots, and antiseptic treatments would have been beneficial. Under other conditions antiseptic treatments were of doubtful benefit. The use of resistant seedling rootstocks appeared promising. Tongue grafts in 72 trials involving over 50,000 trees yielded as many smooth trees as wedge grafts. Adhesive tape wrapping in 145 trials involving over 110,000 trees was found to be more effective in reducing graft knots than any other single practice. This wrapping also reduced losses from breakage. Different adhesive tape wrappers varied in efficiency. The type used in these tests was less expensive than standard surgical tape, and approximately 110 yd. ½ in. wide would wrap 1,000 grafts. On first-year trees there was an average of 57 percent smooth unions following string and similar wrappers, while there was an average of 92 percent smooth unions following suitable tape wrappers. On older trees, after the wrapper no longer protected the unions, the differences were much less.

The following practices promise to contribute to the reduction of graft knots at the unions of trees grown from piece-root grafts: (1) Use of seedling roots from resistant seed, if it becomes available; (2) treatment of seedling roots with a suitable antiseptic, if they are suspected of carrying knot-producing bacteria; (3) use of clean, dry roots when grafting; (4) use of a suitable adhesive tape wrapping; and (5) planting the grafts in soil so handled that it is relatively free from root-chewing insects.

Black pox and other apple-bark diseases commonly known as measles, A. BERG (*West Virginia Sta. Bul. 260* (*1934*), *pp. 31*, *pls. 7*, *figs. 3*).—A destructive apple tree disease, first noted in 1915 and now present in many orchards throughout West Virginia, was suspected at first of being identical with apple "measles", as described by Hewitt and Truax from Arkansas (E.S.R., 29, p. 848), but was proved to be unlike it and caused by a previously undescribed fungus here named *Helminthosporium papulosum* n.sp., with subhyaline to fuliginous conidia, 29 to 45 μ × 6.6 to 8.2 μ, and 3 or more septate, often bearing, under moist conditions, a thin-walled elongation of 3 or 4 more cells. The spores are borne apically on dark brown, thick walled, 2 to many septate conidiophores arising on the scaly plates of diseased bark. The malady is

named "black pox" because of the shiny, blackish papules typical of the early stages. In 1929 tests, infection did not occur prior to the first week in June. The heaviest took place from July 10 to August 8. Penetration occurred directly through the cuticle on young growth, including that 3 yr. of age, and never through lenticels. The incubation period was about 3 weeks.

In the orchard new infections usually appeared on current season shoots in August, but often died out, the papules sloughing off. In many cases, however, they enlarged and formed circular, dark colored, sunken areas from 6 to 12 mm in diameter, walled off by a cork layer through which the fungus sometimes passed, only to be walled off again, this being repeated at times until the lesions had eaten into the pericycle, or even cambium. The dead bark tissue ordinarily did not drop away, and the fungus continued to sporulate upon it perennially.

Outside of West Virginia the disease is now known to occur in New Jersey, Mississippi, Indiana, and Ohio on apples, and in Mississippi on Bartlett pears. Astrachan, Maiden Blush, Rome, and Grimes were very susceptible. Transparent, Pound Royal, Chenango, Summer Queen, York, and Gano appeared immune. In tests, Dutchess, Delicious, and Golden Delicious became infected. Fruit infection has been noted as small black, sunken spots on Grimes Golden from Indiana. Repeated sprays of Bordeaux mixture 4-4-50 and summer strength lime-sulfur eliminated, or greatly reduced, infection.

A different type of trouble, designated as "internal-bark necrosis", was found chiefly on Delicious, often irregularly distributed in the tree. The necrotic areas appear to start deep in the cortex and pericycle. They may later become surrounded by a cork layer, remaining encysted in the bark. The irregularly elevated outer bark may become ridged and later cracked or checked, and in bad cases scaly and rough. This trouble appears generally to start when the tree is young. It may cause early death, but is sometimes outgrown, or it may persist for years, weakening and stunting the tree. The causal factors are still unknown. Neither unfavorable soil or drainage conditions nor winter injury are involved. It has not been experimentally transmitted by grafting nor by aphids. Isolation cultures have yielded no pathogenic organism. It appears to be distributed throughout the United States on Delicious, occurring rarely on Grimes, Northwestern Greening, Rome, Jonathan, and King David. Something similar was noted on *Malus coronaria*.

In West Virginia, the original type of "measles" of Hewitt and Truax appears to be confined mostly to unthrifty trees, chiefly Jonathan and York.

Studies on the canker disease of pear tree caused by Diaporthe ambigua Nitschke [trans. title], I. TANAKA (*Hokkaido Agr. Expt. Sta. Rpt., 31 (1934), pp. 85–122+5–7, pls. 5; Eng. abs., pp. 5–7*).—This fungus canker is a great menace to pear trees in Hokkaido, and it occurs also in Honshu and Chosen (Korea). The first symptom is noted in the spring in a swollen, water-soaked spot on the bark often accompanied with wilting of the leaves. In middle or late June many pycnidia of *Phomopsis* arise on the bark, and in late October or the following spring the perithecia of *Diaporthe* are formed. A brown line is formed between the affected and sound woody tissue. Host cells in the brown line contain a brownish gummy substance. A black line also runs irregularly in the affected wood. It is composed of the plectenchyme of the fungus.

Comparing cultures from mycelium in the water-soaked lesion and from single spores of *Phomopsis* and *Diaporthe*, the author concluded that the *Diaporthe* is the perfect stage of this *Phomopsis*. Germination took place both in fusiform pycnospores and ascospores without swelling. The optimum temperature for germination of the former is 25° C.; of the latter, 20°. The filiforn

pycnospores did not germinate, but produced short ciliate processes, making no further growth. The optimum temperature for mycelial growth was 22°–23°. Higher temperature was required for formation of the two kinds of spores in the pycnidial stage. The optimum acidity for mycelial growth was about pH 5.4. When the medium contained 0.1 percent of tannic acid, it did not grow well. The thermal death point of the spores was 47.5° for 5 min., and when suspended in water the fusiform pycnospore did not survive after freezing for 20 hr., but under the same condition the ascospores were still able to germinate. By inoculation the present fungus was determined to be the causal fungus of the pear canker and to be a wound parasite.

It appears most nearly related to *D. ambigua* and belongs to the subgenus *Tetrastagon*. A description of the species is given.

American gooseberry mildew in Japan [trans. title], I. TANAKA (*Hokkaido Agr. Expt. Sta. Rpt., 31 (1934), pp. 123–139+[1], pls. 2; Eng. abs., p. [1]*).—The species of *Ribes* cultivated in northern Japan were introduced from Europe and America more than 50 yr. ago. In 1927 the American gooseberry mildew was discovered on the European varieties at Kotoni near Sapporo, Hokkaido, but it had been noted by growers the preceding season. In the two succeeding seasons it spread all over Hokkaido and caused great damage, especially to the European varieties, so that some growers abandoned their cultivation. In Hokkaido, *R. grossularia* is the most susceptible, *R. hirtellum* is highly resistant, and *R. nigrum* and *R. rubrum* are immune. From 1928 to 1930 spraying with lime-sulfur, potassium sulfide, and Bordeaux mixture, and dusting with sulfur were tried for control, the lime-sulfur mixture showing the best results. The author recommends spraying with the mixture 5 or 6 times during the period from the opening of buds to the middle of June, with 3 sprays in May.

Life history of the crown-gall organism in relation to its pathogenesis on the red raspberry, W. M. BANFIELD (*Jour. Agr. Res.* [U.S.], *48 (1934), No. 9, pp. 761–787, figs. 6*).—In studies continued over several years at the Wisconsin Experiment Station in cooperation with the U.S.D.A. Bureau of Plant Industry, crown gall bacteria were demonstrated by various experimental procedures to be released in large numbers from the surfaces of living crown galls under suitable moisture conditions, to overwinter in the soils of fallow fields, to exist in a pathogenic state for 14 mo. in unsterilized soil, to be carried on red raspberry plants to new areas in incipient infections which could not be detected by inspection, and to gain entrance to the underground parts of the red raspberry only through injuries, chiefly those caused by root-feeding arthropods. Injuries caused to the underground parts of the red raspberry were found to remain subject to infection by *Phytomonas tumefaciens* for a varying period, the longest being 7 weeks. The incubation period of the disease was found to vary from 11 days to more than 28 days, depending on seasonal and other environmental conditions. Crown gall infection made itself evident through the appearance of new galls at a practically uniform rate throughout the course of the active growing season on red raspberry plants grown in inoculated soil. White grubs (*Phyllophaga* sp.) caused most of the injuries through which infection occurred on the underground parts of such plants in 1930.

Raspberry diseases and their control in Illinois, H. W. ANDERSON and K. J. KADOW (*Ill. State Hort. Soc. Trans., 67 (1933), pp. 82–90*).—This article discusses the raspberry disease situation and presents a spray program worked out by the Illinois Experiment Station.

Withering of grapes produced by lightning [trans. title], E. CORNELI (*Riv. Patol. Veg., 23 (1933), No. 1–2, pp. 37–41*).—A row of grapevines all at-

tached to the same iron wire was observed with foliage withering and all tissues of the vines browned, especially in the internodes down to the soil level. A few shoots growing from the base of the stem and not in contact with wire were normal. The symptoms generally corresponded with those previously described for lightning injury.—(*Courtesy Biol. Abs.*)

Influence of temperature and humidity on the life processes of Phytophthora parasitica, the cause of gum disease of citrus [trans. title], H. J. TOXOPEUS (*Landbouw* [*Buitenzorg*], *9* (*1934*), *No. 8, pp. 385–421, figs. 5; Eng. abs., pp. 418–421*).—The periodicity of this disease of *Citrus sinensis* was studied from 1928 to 1931 in the vicinity of Poenten (1,000 m altitude), Sekar (600 m), and Prigen (700 m), near Malang, eastern Java. In 1931 experiments were conducted on the influence of temperature and humidity on growth, on the formation of sporangia, and on the liberation of swarm spores of this fungus. Infections occurred mainly in the second half of the rainy season, and even then fluctuations occurred corresponding closely with the variations in rainfall. The main habitat of the fungus is the soil, where sporangia and swarm spores are also formed. The temperature and moisture of the soil, as influenced by sunshine and rain, are probably the main factors in the development and spread of the mold. The fungus was found to be exposed to very different temperatures and humidities at different periods of the year.

The optimum temperature for mycelial growth in the laboratory appeared to be 31° C. Even a daily rise of temperature to 35° was sufficient to stop growth. Growth, however, was normal again after 1 day if the temperature was immediately thereafter kept constant at 22°. A daily rise to 40° or higher was very harmful. A short exposure to 50° will probably kill the fungus. The mycelium grows under moist conditions only. When kept in air-dry soil it remains alive for more than 6 mo., though it is very much weakened and even under very favorable conditions does not start growth before 2 weeks afterwards. Sporangia are formed in great abundance at 24°–29°, and only under moist conditions and in water when there is plenty of oxygen. Swarm spores are freed from the sporangia when the temperature suddenly rises or falls, hence at the beginning of a shower the drop in temperature generally is sufficient to cause the release of swarm spores. When sporangia are formed it is often a rather long time before conditions are favorable for liberation of swarm spores. Sporangia kept at about 24° in air-dry soil, even after 3 weeks, formed swarm spores. In moist and in very wet soil, spores can still be released after 45 days. Under these conditions, however, secondary sporangia may be formed. When kept constantly at 37° in water for some minutes, the ability of sporangia to form spores is lost, and they are injured when kept constantly at 34° for some time.

From laboratory experiments it was concluded that from 4 to 6 days of dry, sunny weather are enough to prevent formation of swarm spores at the beginning of the first shower. During the dry monsoon the fungus is very much injured. Only when the soil is constantly moist for at least from 3 to 4 weeks can the fungus wholly recover. In the wet season only dry periods of at least 6 days will do much harm to the fungus. It takes some time before infections occur in a rainy period following a dry one within the wet monsoon. The gum disease occurs in Java only in the regions higher than 400–500 m.

Is psorosis of citrus a virus disease? H. S. FAWCETT (*Phytopathology, 24* (*1934*), *No. 6, pp. 659–668, figs. 3*).—The previously well-known symptoms of psorosis evidenced by localized areas of scaly bark had led to the hypothesis that the cause should be looked for in a microscopic organism. In May 1933

a mosaiclike effect showing as small light-colored areas in the region of the smallest veinlets on young, rapidly growing leaves on Valencia orange trees affected by psorosis was discovered in the vicinity of the California Citrus Experiment Station. Light-colored translucent spots, sometimes with raised corky centers or raised corky rings on mature leaves, were less common. Circular bands or furrows on fruit were rarely found. The disease is transmitted readily by budding or by rooting leafy shoots. Experiments and observations indicate that the disease may occur either in a localized form restricted to a portion of the bark or in a systemic form spread throughout the tree to the buds, leaves, and other parts.—(*Courtesy Biol. Abs.*)

Some observations on the causes of the surface blemishes of oranges in South Australia, J. DAVIDSON (*So. Aust. Dept. Agr. Bul. 279 (1933), pp. 251–259, figs. 4*).—This article reports preliminary observations made in 1931 and 1932 on blemishes due to mechanical injury to the rind, to damage caused by insects, and to oleocellosis.

Stunt: A virosis of delphinium, G. BURNETT (*Phytopathology, 24 (1934), No. 5, pp. 467–481, figs. 8*).—In work conducted at the Washington Experiment Station on the virosis of perennial delphinium known as "stunt" or witches'-broom, common in Washington, Idaho, and other portions of the United States, the virus was experimentally transmitted by mechanical methods to 4 varieties of delphinium and 12 other species of plants, including tomato, cucumber, and tobacco. Sixteen other species of plants, when tested in a similar manner, gave negative results. The symptom expressions of this virus on a given suscept were extremely variable. On delphinium there may be produced one or all of the following symptoms: Dwarfing, increase in the number of shoots, mottling, chlorosis, savoying or cupping of the laminae, necrotic patterns on both the stems and leaves, and a greening and malformation of the floral parts. This virus when combined with certain other known viruses produced variable and often extreme symptoms on tomato and tobacco.—(*Courtesy Biol. Abs.*)

A disease of Eriobotrya japonica [trans. title], V. BONGINI (*Bol. Lab. Sper. Fitopat. [Torino], 28 (1933), No. 1, pp. 4–8, figs. 2*).—*Phoma eriobotryae* n.sp. is described, with notes on its life history and the damage which it causes.—(*Courtesy Biol. Abs.*)

The gladiolus dry rot caused by Sclerotinia gladioli (Massey) n.comb., F. L. DRAYTON (*Phytopathology, 24 (1934), No. 4, pp. 397–404, figs. 3*).—The fungus causing this disease was previously known as *Sclerotium gladioli*. The microconidia developed by this fungus and an ascogonial system in receptive structures borne on a stroma comprise the sexual components that accomplish the formation of apothecia of the *Sclerotinia* type. On the basis of this, the new combination *S. gladioli* is proposed, and an emended diagnosis is given. In addition to all of the cultivated varieties of *Gladiolus* spp., the following susceptible species are noted: *Tritonia* (*Montbretia*) *crocosmaeflora*, *Freesia* spp., *Lapeirousia* (*Anomatheca*) *cruenta*, and *Crocus* spp. Rhizomatous iris, tulip, hyacinth, and narcissus varieties are immune to this disease.

Control of gladiolus scab, R. P. WHITE (*N.J. Agr. [New Jersey Stas.], 16 (1934), No. 3, p. 6*).—Bacterial scab was satisfactorily controlled in 1933 by soaking corms of 3 varieties in a suspension of 1 lb. of powdered calomel in 2.5 gal. of water for 3 to 5 min. Discarding of badly diseased planting stock and soil rotation are advised.

A bacterial disease of Hedera helix, R. P. WHITE and L. MCCULLOCH (*Jour. Agr. Res. [U.S.], 48 (1934), No. 9, pp. 807–815, pls. 2*).—This cooperative investigation between the New Jersey Experiment Stations and the U.S.D.A. Bureau

of Plant Industry deals with *Bacterium hederae*, the cause of a leaf spot and stem canker of English ivy, which has been reported from Europe but not completely described. In the United States it was first reported in 1930 in New Jersey where it caused considerable loss in a commercial greenhouse. It has been found also in New York, Georgia, Maryland, Virginia, and the District of Columbia. The disease attacks *H. helix* and several, perhaps all, of its horticultural varieties. Infected outdoor plants are seldom seriously damaged, but in the cuttings from such plants placed under greenhouse conditions the disease often develops and spreads rapidly, either entirely destroying the plants or rendering them unsalable. The present paper gives a complete description of the disease and of the causal organism, which is a short, rather small rod, with a single polar flagellum, capsulate, forming thick, translucent, glistening, yellowish colonies on potato dextrose agar.

Stem canker of hollyhock caused by Sclerotinia sclerotiorum, P. A. YOUNG (*Phytopathology, 24 (1934), No. 5, pp. 538–543, figs. 2*).—According to this contribution from the Montana Experiment Station, *S. sclerotiorum* caused lethal white to light brown girdling cankers from 5 to 45 cm long in stems of hollyhock (*Althaea rosea*). Hollyhock appeared to be more resistant than sunflower to this fungus.

Rose disease control, R. P. WHITE (*N.J. Agr. [New Jersey Stas.], 16 (1934), No. 3, pp. 5, 6*).—Black spot, brown canker, and powdery mildew were all controlled by the use of sulfur in tests at the New Jersey Experiment Station. To be effective the sulfur needed to be finely divided and applied with thoroughness either as a spray or dust previous to rainy periods, the number of applications varying with the season. In 1931 eleven applications gave good control but in 1933 the same number proved inadequate to hold black spot and brown canker in check.

A Phytophthora disease of snapdragons, M. R. HARRIS (*Phytopathology, 24 (1934), No. 4, pp. 412–417, fig. 1*).—A hitherto unreported wilt of snapdragons was found killing 50 percent of the plants in beds in a large greenhouse near San Leandro, Calif. Three organisms, an undetermined bacterium, *Cephalosporium acremonium*, and a *Phytophthora* species were isolated from the diseased tissues. Inoculation experiments, using these three organisms in pure cultures and mixed cultures, showed that the *Phytophthora* species was the pathogenic organism causing the trouble. A study of the *Phytophthora* fungus showed that it was identical with *P. cactorum*. A histological study of the fungus in the plant tissue was made and described.

The disease was controlled by treating the greenhouse soil with steam sterilization.

Fourth report of progress on studies of the control of walnut blight in Oregon, P. W. MILLER (*Oreg. State Hort. Soc. Ann. Rpt., 25 (1933), pp. 139–153*).—This article presents the results of studies conducted cooperatively by the U.S. Department of Agriculture and the Oregon Experiment Station. The best results from spraying against walnut blight with Bordeaux mixture were obtained when applications were made just before the female flowers bloomed, and immediately after bloom when small, brown spots began to appear in the stigmas. Later applications failed to result in appreciable benefit in 1933.

Under western Oregon conditions, Bordeaux mixture 3–3–50 appeared to be practically as effective as higher strengths. Well-timed spraying with Bordeaux mixture resulted in increased yields and improvement in quality, the percentage of blighted and misshapen nuts being appreciably reduced.

In seedling orchards, where the trees vary greatly in blooming dates, reasonably effective protection was obtained by spraying over a relatively long period

with a sufficient number of applications to maintain protection for early and late trees as well, but the cost and trouble involved are expected to discourage spraying in such orchards.

Four applications of a proprietary colloidal dusting sulfur apparently caused a substantial reduction in blight attack. Four applications of a proprietary copper-lime dust and a Bordeaux-lime dust, respectively, did not, however, give satisfactory control.

Inconsequential injury to foliage sometimes followed application of Bordeaux mixture to young leaves. Bordeaux mixture containing three times as much lime as copper sulfate reduced, but did not entirely eliminate, leaf burn. Practically no injury was noted in plats treated with a Bordeaux-oil emulsion spray. Ammoniacal copper carbonate 2–50, zinc lime 8–8–50, and copper carbonate 4–50 were relatively noninjurious, but the latter two failed to control walnut blight as well as Bordeaux mixture 3–3–50. Ammoniacal copper carbonate, however, gave almost as complete protection, and it caused only a relatively small amount of leaf injury. It was considered worthy of further trial.

Decline and death of cypresses at S. Giovanni of Patano (Perugia) [trans. title], E. CORNELI (*Riv. Patol. Veg., 23 (1933), No. 1–2, pp. 15, 16*).—The death of two beautiful rows of cypress trees caused by cold weather beginning in 1928 is recorded. At the time of examination, 1.5 yr. after the cold period, the leaves were reddening and the cambium was mostly dead. A similar row had been destroyed by a severe winter at the same place about 86 yr. previously.—(*Courtesy Biol. Abs.*)

Survival of blister-rust mycelium in western white pine, H. G. LACHMUND and J. R. HANSBROUGH (*Jour. Agr. Res. [U.S.], 48 (1934), No. 11, pp. 1043–1047*).—In investigations conducted at Chee Kye and at Owl Creek in western British Columbia, branches of western white pine (*Pinus monticola*) bearing cankers produced by blister rust (*Cronartium ribicola*) were cut off just above the lower limits of the typical orange discoloration associated with the advance of the rust in the bark. No living needles or small side branches were present between the cut ends and the trunks of the trees. An equal number of uninfected branches were cut off at corresponding places. Data taken at successive periodic intervals showed that the uninfected truncated branches used as checks were practically all dead within 1 yr., that the cankered stubs remained alive for periods up to 5 yr., or until the mycelium grew into the trunk, and that the rate of advance of the mycelium was almost identical with that in unsevered branches girdled by cankers and only slightly less than it was in normal cankers. Cankers on "flagged" (end killed) branches, however, generally survived for shorter periods than cankers on cut-off branches. The presence of blister rust mycelium in the bark apparently stimulated a reversal of the flow of assimilates and tended to keep the infected branches alive until the mycelium was able to reach the trunk.

Aphelenchoides xylophilus n.sp., a nematode associated with blue-stain and other fungi in timber, G. STEINER and E. M. BUHRER (*Jour. Agr. Res. [U.S.], 48 (1934), No. 10, pp. 949–951, fig. 1*).—*A. xylophilus* n.sp. exemplifies the ability of nematodes to adapt themselves to unusual ecological conditions. This nematode, found in five instances, is apparently specialized to live in timber (*Pinus echinata* and *P. palustris*) affected by blue stain and other wood fungi (*Ceratostomella pini* and *Trichosporium*). It may revive upon soaking in water after living for 1 yr. in dried wood. Technical description and diagnosis of the new species are given.

The effect of crop rotation on the eelworm (Heterodera schachtii) disease of cereals, S. D. GARRETT (*Jour. Dept. Agr. So. Aust., 37 (1934), No. 8,

pp. 984–987, fig. 1).—"In a combined manurial rotation experiment at the Waite Institute, it was found that eelworms (*H. schachtii*) caused considerable injury in plats which had been under cereals for five consecutive years, whereas in plats where peas or bare fallow alternated with cereals the damage was of very small proportions. Manurial treatments of superphosphate or sulfate of ammonia had no appreciable effect on the amount of disease."

The trap crop as a means of reducing root-knot-nematode infestation, G. H. Godfrey and H. M. Hoshino (*Phytopathology, 24 (1934), No. 6, pp. 635–647, figs. 2*).—In an experiment in Hawaii in which heavily nematode-infested soil in 1-gal. cans was planted with well-rooted tomato plants and the plants removed with entire root systems before reproduction of nematodes had taken place, over 98 percent of the effective nematode population was taken out by this method, but even three subsequent plantings in the same soil did not totally eliminate all remaining nematodes.

The roots removed from the plants of the first planting and thoroughly washed were used to inoculate newly planted pots of nematode-free soil. Only occasional larvae transmitted infection when the plants used as the source had been growing 24 days or less. Roots of plants that had grown for 27 days, however, transmitted heavy infestations, owing to the abundance of eggs present by that time. In another test, with cowpeas as trap crops and with 50 nematode larvae to the 5-gal. container, 22 percent were caught by a single planting. With 500 larvae in each, 30 percent were caught. Most of the uncaught larvae perished in the soil or were otherwise ineffective in producing infections in subsequent plantings, however.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Principles of animal biology, A. F. Shull (*New York and London: McGraw-Hill Book Co., 1934, 4. ed., [rev.], pp. XIV+400, pl. 1, figs. 290*).—A new edition of this work, prepared in collaboration with G. R. Larue and A. G. Ruthven (E.S.R., 62, p. 446).

The habits and characteristics of nocturnal animals, S. C. Crawford (*Quart. Rev. Biol., 9 (1934), No. 2, pp. 201–214*).—This contribution is presented in connection with 70 references to the literature.

The present status of the muskox in Arctic North America and Greenland, E. Hone (*Amer. Com. Internatl. Wild Life Protect., Spec. Pub., 5 (1934), pp. 87, pls. 4, figs. 3, maps 2*).—Following a brief introduction this work deals with the distribution, history of extirpation, preservation, and the natural history, with a general description, of the musk ox, *Ovibos moschatus*. A bibliography of four pages chronologically arranged is included, and large-size maps showing the distribution of these animals in North America and Greenland are attached.

Seasonal and nutritional studies on animal peltries, J. Caspe, F. G. Ashbrook, and C. E. Kellogg (*Jour. Tech. Assoc. Fur Indus., 5 (1934), No. 2, pp. 70–82*).—In this article, prepared jointly by the Technical Association of the Fur Industry and the U.S.D.A. Bureau of Biological Survey, the authors discuss seasonal variations and their effect upon fur peltries and the effect of the plane of nutrition upon the animal peltries.

Field observation in economic ornithology, E. R. Kalmbach (*Wilson Bul., 46 (1934), No. 2, pp. 73–90*).—The author calls attention to certain limitations of the well-established stomach examination method of research in the field of economic ornithology and of the application of data obtained by this means, especially as applied to destructive species of birds. He emphasizes the im-

portance of data obtainable largely through field observations and experimentation. The interpretation of food items, food percentages and economic status, and the sequel are considered.

The rôle of environment in the life of birds, S. C. KENDEIGH (*Ecol. Monog., 4 (1934), No. 3, pp. 299–417, figs. 27*).—This contribution is presented in connection with a nine-page list of references to the literature.

A field guide to the birds, R. T. PETERSON (*Boston: Houghton & Mifflin Co., 1934, pp. XXI+167, pls. 36, figs. 18*).—This practical handbook for identification of birds of eastern North America, giving field marks of all species, includes illustrations in color and in black and white.

Birds of the South: Permanent and winter birds commonly found in gardens, fields, and woods, C. H. GREEN (*Chapel Hill: Univ. N.C. Press, 1933, pp. XV+277, pls. 32, figs. 31*).—A popular account presented in 54 chapters, with an introduction by C. S. Brimley.

Migratory bird protection in North America, J. C. PHILLIPS (*Amer. Com. Internatl. Wild Life Protect., Spec. Pub., 1 (1934), No. 4, pp. 38*).—A history of control by the U.S. Government and a sketch of the treaty with Great Britain.

The parasites of British birds and mammals, G. B. THOMPSON (*Ent. Mo. Mag., 3. ser., 20 (1934), No. 234, pp. 133–136*).—A brief discussion in connection with a list of nine references to the literature.

Insect and acarid parasites of domestic animals in Yugoslavia [trans. title], B. IVO (*Vet. Arhiv., 4 (1934), Nos. 4, pp. 190–192; 5, pp. 193–195*).—Host lists of the insects, ticks, and mites attacking domestic animals in Yugoslavia are presented in connection with 12 references to the literature.

[Contributions on endoparasites] (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 1, pp. 1–4, 5–7, 8–11, 12–15, 22, figs. 5*).—Included among the contributions (E.S.R., 71, p. 242) here presented relating to endoparasites are the following: A New Trematode [*Stephanoproraoides lawi* n.g. and n.sp.], by E. W. Price (pp. 1, 2); Two New Species of Trematodes, *Scaphiostomum pancreaticum* n.sp. and *Postharmostomum laruei* n.sp., from the Chipmunk, by A. McIntosh (pp. 2–4); Egg Albumen as a Mounting Medium in the Study of Living Helminths, by W. H. Krull (pp. 5, 6); The Discharge of Eggs from Segments of *Thysanosoma actinioides*, by M. C. Hall (pp. 6, 7); The Occurrence of *Taenia ovis* in Dogs at Washington, D.C., by W. H. Wright and J. Bozicevich (p. 7); The Use of Hexylresorcinol in the Treatment of Tapeworm Infestation, by O. R. McCoy (p. 7); *Daubaylia potomaca* [n.g. and] n.sp., a Nematode Parasite of Snails, with a Note on Other Nemas Associated with Molluscs (pp. 8, 9) and Somatic Musculature in Nematodes (pp. 9, 10), both by B. G. and M. B. Chitwood; *Capillaria hepatica* from the Liver of *Castor canadensis canadensis*, by B. G. Chitwood (p. 10); A New Nematode from Birds [*Avioserpens denticulophasma* n.g. and n.sp.], by E. E. Wehr and B. G. Chitwood (pp. 10, 11); A New Host for the Bird Darcunculid, *Avioserpens denticulophasma*, by E. E. Wehr (p. 11); Observations on the Period Required for *Ascaris* Eggs to Reach Infectivity (p. 12), Life History of *Metastrongylus salmi* and Remarks on the Eggs of the Swine Lungworms (pp. 12, 13), and New Intermediate Hosts for Some Heteroxenous Nematodes (p. 13), all by J. E. Alicata; *Trichostrongylus longispicularis* Collected from Cattle in the United States, by J. S. Andrews (p. 13); An Experimental Infestation of *Nippostrongylus muris* in Mice, by D. A. Porter (pp. 13, 14); The Effect of "Burning Over" Land on the Viability of the Larvae of *Stephanurus dentatus*, by L. A. Spindler (p. 14); Notes on the Life History of *Cheilospirura hamulosa*, the Chicken Gizzard Worm, by E. Cuvillier (pp. 14, 15); and Localization of *Trichomonas columbae* in the Domestic Pigeon, Ring Dove, and Mourning Dove, by G. E. Cauthen (p. 22).

[Contributions on ectoparasites of animals] (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 1, pp. 21, 22*).—Contributions (E.S.R., 71, p. 242) on ectoparasites include the following: The Identity and Origin of the Sucking Lice of American Monkeys, by H. E. Ewing (p. 21); and *Haemaphysalis cinnabarina* Koch 1844 [=*H. chordeilis*] from the Sharp-Tailed Grouse (p. 21), Ticks from Australia (pp. 21, 22), and Distribution of *Boophilus annulatus australis* (Fuller) in the United States (p. 22), all by A. McIntosh.

Studies on the life-history of anoplocephaline cestodes, H. W. Stunkard (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 6 (1934), No. 4, pp. 481–507*).—This contribution, presented in connection with a list of 48 references to the literature, reviews studies on the life history of anoplocephaline cestodes, reports on a study of the eggs of *Cittotaenia*, and records experiments planned to test the possibility of direct infection, all of which have given entirely negative results.

It is concluded that "onchospheres are not infective for the primary host, that an intermediate host is required, that the onchospheres when voided are infective for the intermediate host, and that the larvae develop to the cysticercoid stage in the body cavity of some invertebrate animal."

The morphology and development of the preparasitic larvae of Poteriostomum ratzii, J. T. Lucker (*Jour. Wash. Acad. Sci., 24 (1934), No. 7, pp. 302–310, figs. 12*).—This contribution is said to be the first to report on the larval development that occurs in members of the genus *Poteriostomum*. The nematodes from which cultures were made were taken from the colons of two horses at post-mortem examination.

It was found that "the first-stage larva of *P. ratzii* hatches from the egg in from 22 to 40 hr. when kept in water cultures at room temperature (20° to 26° C.); the larva is rhabditiform, varies in length from 450 to 620μ, and is provided with a long filamentous tail. . . . The early second-stage larva is similar to larvae of the preceding stage except that its cuticle is thick and prominently striated. Shortly after the first molt, the excretory pore and excretory canal become clearly visible. Second-stage larvae are from 600 to 850μ long. . . . The third-stage strongyliform larva has a short tail and is from 443 to 585μ long. The sheath in which the larva is enclosed is from 650 to 850μ long, and is characterized by great thickening of its walls in the region immediately posterior to that occupied by the tail of the fully extended larva. A minimum of 115 hr. was required for the development from the uterine egg to the infective larva."

The historical background of entomology in relation to the early development of agriculture in California, E. O. Essig (*Pan-Pacific Ent., 1 (1934), No. 1, pp. 1–11*).—This contribution is presented in connection with a list of 31 references to the literature.

[Report of work with pecan insects and corn budworm at the Georgia Station] (*Georgia Sta. Rpt. 1933–34, pp. 37–39*).—Brief reference is made to the work of the year with two species of flat-head borers attacking pecan trees, *Chrysobothris femorata* (Oliv.) and *C. chrysoela* (Ill.), and control of the pecan weevil, *Curculio caryae* (Horn) by means of insecticides. Brief reference is also made to a study of the ecology and control of the southern corn rootworm, referred to as the corn budworm.

Summary of the population of injurious insects in Kansas for 1933.—The third annual summary, R. C. Smith (*Jour. Kans. Ent. Soc., 7 (1934), No. 2, pp. 37–51*).—In contributing from the Kansas Station in continuation of the observations of the preceding year (E.S.R., 69, p. 825), the author first presents a summary of the weather of Kansas for 1933, followed by a sum-

mary of the numbers of questionnaires returned and explanatory notes on the more striking insect conditions during 1933. In the summary the author lists the insects (1) that were less numerous, (2) those approximately as plentiful, and (3) those more plentiful, than in 1932.

[Contributions on economic insects and their control] (*Md. State Hort. Soc. Proc., 35 (1933), pp. 85–96; 36 (1934), pp. 8–40, 51–53, figs. 2*).—The contributions here presented (E.S.R., 67, pp. 560, 565) in the proceedings of 1933 are Pertinent Facts with Regard to Insect Control in 1932, by E. N. Cory (pp. 85–92), and Combating Codling Moth, by F. W. Farnsworth (pp. 92–96); those of 1934 are The Rosy [Apple] Aphid and Its Control, by F. S. Hartzell (pp. 8–16); Codling Moth Control, by W. S. Hough (pp. 16–20); Controlling Codling Moth in Our Orchards, by R. A. Simpson (pp. 20–26); Cleaning Heavily Sprayed Fruit, by D. F. Fisher (pp. 27–37); Growers' Problems in Removing Spray Residue, by R. A. Simpson (pp. 38–40); and Our Insect Control in 1934, by E. N. Cory (pp. 51–53).

[Economic insects in the Province of Quebec] (*Pomol. and Fruit Growing Soc., Quebec, Ann. Rpt., 40 (1933), pp. 89–102*).—The Fight against an Orchard Pest: The Apple Maggot (*Rhagoletis pomonella* Walsh) is reported upon by G. Maheux (pp. 89–96), and Insects Attacking the Foliage and Fruit of Apple Trees, by J. B. Maltais (pp. 97–102).

[Report of work in economic entomology at the Texas Station] (*Texas Sta. Rpt. 1933, pp. 41–53, 113, 114, 157, 161, 214–217, 229, 230*).—The work of the year referred to (E.S.R., 70, p. 206) includes that with the sorghum worm by H. J. Reinhard; boll weevil hibernation by Reinhard, E. W. Dunnam, and R. W. Moreland; cotton flea hopper—infestation by F. L. Thomas and F. F. Bibby, its varietal resistance by Thomas, H. B. Mills, and S. E. Jones, strip planting by J. C. Gaines and Thomas, migration, dispersal, and population by Gaines, control by Bibby, and hibernation by Reinhard; pink bollworm, in cooperation with the U.S.D.A. Bureau of Entomology, by F. A. Fenton and W. L. Owen, Jr.; cotton bollworm, in cooperation with U.S.D.A. Bureau of Entomology—hibernation by R. K. Fletcher, biological studies by Thomas and Mills, migration and dispersal by Gaines, and control by Dunnam, Moreland, and Fletcher; use of sulfur as an insecticide by Bibby, Reinhard, and Jones; pecan nut casebearer by S. W. Bilsing; apiary inspection, 1932–33, by Thomas and C. E. Heard; truck crop insect investigations, particularly plant lice, by J. N. Roney; other insect investigations, including cotton boll weevil and flea hopper control at Winterhaven, plant lice on melons, etc., and false wireworm, all by S. E. Jones; activities of bees, and bee products, by H. B. Parks; adaptability of native plants, and queen breeding, by Parks and A. H. Alex; horsemint for honey and oil production by Parks and G. S. Fraps; the sugarcane moth borer and sugarcane beetle, conducted in cooperation with the U.S.D.A. Bureau of Entomology at the Beaumont Substation, by A. L. Balzer; insect pests at the Temple Substation by C. H. Rogers and S. E. Wolff; insects affecting animals, in cooperation with the U.S.D.A. Bureau of Entomology at the Sonora Substation, including goat louse, goat scab (*Chorioptes caprae*), and grub in the head of sheep (*Oestrus ovis*), all by O. G. Babcock, I. B. Houghton, and W. T. Hardy; and control of citrus rust mite and other citrus insects, including coccids, palm beetles, onion thrips, bean leaf hopper, and leaf-footed plant bugs, all by S. W. Clark at the Weslaco Substation.

Investigations on the insect and allied pests of cultivated mushrooms.—I, Sciara fenestralis Zett., M. D. Austin and S. G. Jary (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 59–62, figs. 3*).—In this first contribution the authors deal with the fungus gnat *S. fenestralis*.

Control of strawberry pests by hot-water treatment of runners, W. E. H. Hodson (*Jour. Min. Agr.* [*Gt. Brit.*], *40* (*1934*), *No. 12, pp. 1153–1161, pl. 1*).—This contribution outlines the results of recent investigations of the control of certain strawberry pests by the hot-water treatment and indicates how such results may in some cases be determined of practical advantage. It was found in preliminary experiments in 1930 with small numbers of plants in the laboratory that 10-min. immersion at 110° F. effected a 100 percent kill of the strawberry mite (*Tarsonemus fragariae*), aphid, etc., and that immersion at that temperature for not more than 30 min. had little or no deleterious effect upon the plants. Similar results obtained in 1931 led to the treatment of runners on a large scale in the fall and winter of 1932, with satisfactory results. Plants treated in 1931 and 1932 for not less than 20 min. and planted isolated from other strawberries remained remarkably vigorous and entirely free from these pests. It is pointed out that runners must be placed loosely in the water, for if packed in or tied in bundles penetration of the heat will be uneven and too slow.

Pests of banana in Jamaica, W. H. Edwards (*Jamaica Dept. Sci. and Agr., Ent. Circ. 14* (*1934*), *pp. 19, pls. 11*).—After briefly considering the insect and related animal pests of the banana in Jamaica, the author emphasizes the fact that only the banana root borer is at present of economic importance in Jamaica. The account is devoted largely to its biology and control.

A study of the insect fauna of a coniferous reforestation area in southeastern Ohio, G. R. Easterling (*Ohio Jour. Sci., 34* (*1934*), *No. 3, pp. 129–146, figs. 2*).—A study made of the insect fauna of York Forest, a reforested area in Athens County, is reported upon and a comparison made with the insect fauna of other coniferous areas. A list of the principal coniferous pests of eastern North America, arranged systematically, is included.

A very destructive pest of stored products in south India, Corcyra cephalonica Staint. (Lep.), P. N. Krishna Ayyar (*Bul. Ent. Res., 25* (*1934*), *No. 2, pp. 155–169, pl. 1, figs. 6*).—This contribution relates to the biology and control of the rice moth *C. cephalonica*, found to be one of the five chief lepidopterous insects affecting stored products in south India, it having been first reported from Madras in 1919.

The effect of arsenic, as used in poisoning grasshoppers, upon birds, F. E. Whitehead (*Oklahoma Sta. Bul. 218* (*1934*), *pp. 54, figs. 8*).—Following an introduction and review of the literature in connection with a list of 60 references, the author reports upon experiments conducted with a view to determining to what extent the lives of birds are endangered through the use of poison bran mash as used in the control of grasshoppers and, further, to determine whether birds, especially chickens, would obtain a sufficient amount of arsenic to affect humans or other animals that might eat them after having fed on the poison bran or on poisoned grasshoppers.

In conducting the work domestic fowls and quail were confined in pens and left without food for 24 hr. Poisoned bran was then scattered in the pens at the rate of 100 lb. per acre and the fowls were left another 24 hr. without other food. No indications of poisoning appeared, and it was concluded that birds will not be injured through picking up well scattered poisoned bran.

"Feeding experiments in which poisoned bran was force-fed to chickens indicated that 74 mg of white arsenic (As_2O_3) constituted a slightly toxic dose for a 22-oz. chicken. From this it was assumed that 3.363 mg per ounce of bird weight constituted a slightly toxic dose." A series of experiments were then conducted in which 144 birds, including chickens, turkeys, ducks, quail, and the nestlings of various species of songbirds were fed 17,377

poisoned and unpoisoned grasshoppers. These experiments were continued from 10 to 66 days. The results obtained led to the following conclusions concerning domestic fowls:

"They readily recognize the fact that poisoned grasshoppers are not as desirable a food as unpoisoned grasshoppers. As a result of this they will eat less than half the number of poisoned grasshoppers that they will of unpoisoned grasshoppers. The amount of arsenic consumed through feeding on poisoned grasshoppers averages much less than one-half of a toxic dose. Even though no other food is available for a period of 10 days, the fowls will not eat a sufficient number of grasshoppers to obtain a toxic dose. The arsenic obtained through eating the poisoned grasshoppers does not have a cumulative effect even though the fowls were fed for a period of 66 days. Feeding on poisoned hoppers does not materially affect the weight or growth of the fowls."

The work with quail led to the conclusion that even if they eat "the maximum number of grasshoppers they have ever been recorded as having eaten, they will not be noticeably injured though each of the grasshoppers was killed by feeding on poisoned bran."

With wild birds it was concluded that "nestling robins, and presumably other species of a similar size, can consume as many as 134 poisoned grasshoppers containing 39.986 mg of As_2O_3 and still mature normally. Poisoned grasshoppers may be somewhat injurious to nestling birds, although the evidence is incomplete. There is very little danger, if any, to adult wild birds. It must be shown that the parent birds pick up dead grasshoppers and feed them to nestlings before any danger to nestling birds can be claimed. The few observations made do not indicate that such is the case."

The studies have shown that "chickens never consumed a sufficient amount of arsenic at any one time to constitute a dangerous dose for humans, and therefore the only possibility of humans receiving such an amount from eating chickens was for the arsenic to be stored in the edible portions of the body. Chemical analyses were made of the bodies of a number of chickens that had eaten large numbers of poisoned grasshoppers. These analyses showed definitely that there is no danger of humans being poisoned from eating chickens that have eaten poisoned grasshoppers.

The present status of cryolite as an insecticide, D. M. DeLong (*Ohio Jour. Sci., 34 (1934), No. 3, pp. 175–200, figs. 6*).—A résumé of the literature, presented in connection with a list of 80 references, and experimental work have led to the conclusion that "synthetic cryolite is superior to natural cryolite, and in view of its physical and chemical properties is well adapted to insecticidal work. Experimental work has indicated that cryolite has a relatively high toxicity to insects and gives the minimum of plant injury when properly used.

"Fluorine when added in chemical form to food materials or injected into body tissues has given indication of chronic effects, but other experiments conducted in a similar manner have given contradictory results. Also there is no available data regarding the effects of fluorine when plants sprayed with materials containing it were used as the source of food. Furthermore, all experimental work to date has been performed with the soluble neutral fluorides, and there is no data available upon the use of the insoluble fluorides, although tolerance figures are placed upon these latter materials upon the basis of experimentation with the more soluble forms."

The cultivation, toxic constituents, uses, chemical analysis, and extraction of derris, F. T. Adriano (*Philippine Jour. Agr., 5 (1934), No. 1, pp. 1–15, pls. 2*).—An account of *Derris elliptica* is presented in connection with a list of

24 references to the literature cited. Information on the yield per acre and analyses of different samples of derris and of some varieties of derris roots are presented in tabular form.

Experiments with sulphur and pyrethrum, D. M. DeLong (*Crop Protect. Inst., Bul. Ser., No. 44 (1934), pp. 7*).—Experiments conducted have shown that sulfur when applied to certain plant leaves may in the course of a few days after commencing to feed cause the death from motor paralysis of insects sucking the juices of such leaves. This was first demonstrated with the potato leaf hopper through the use of Bordeaux mixture and other copper compounds and has more recently been produced by various sulfur materials. Although these materials may be insoluble when placed upon the plant tissue, they in some way either cause the plant to produce abnormal quantities of toxic material which is normally produced by the plant only in very minute quantities, or the chemical effect upon the plant may be direct and cause the character of the sap to change remarkably or the general rate of metabolism to change by the presence of extremely small amounts of insecticide which have been absorbed in some form by the plant. The experimental work has given evidence of both possibilities.

While pyrethrum may be used to kill various sucking insects, its effects are temporary and it does not cause the death of insects hatching or appearing at a later date on the plant. Sulfur, however, when applied to the leaf may bring about the death of these insects through the residual action which may last for 2 or even 3 weeks. Finely ground sulfur (300 mesh) gives excellent effects and is easy to apply. A combination of sulfur and pyrethrum gives greatest protection because the pyrethrum brings about immediate kill of insects present at the time of application, while the sulfur, through residual effects, kills insects hatching or appearing later. A combination of sulfur and pyrethrum at the rate of 95:5, or 90:10, is efficient. Sulfur alone will give practical control of various sucking insects, but applications must begin earlier.

It is thought that these same general effects may have been responsible for the results obtained by List and Daniels following the application of lime-sulfur to potatoes (E.S.R., 71, p. 221), a reprint of which report is appended.

Studies on the ovicidal action of winter washes, 1932 trials, M. D. Austin, S. G. Jary, and H. Martin (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 63–83, fig. 1*).—In laboratory tests of the ovicidal efficiency of various oils on the eggs of the common green capsid *Lygus pabulinus* Linn., it was found that "(1) at 6 percent, petroleum and vegetable oils are more effective ovicides than tar oils. (2) Of 18 petroleum oils of different characteristics and bases, all, with the exception of one, gave a complete control of the capsid when applied at 5 percent; at 3 percent there were differences in ovicidal efficiency. No correlation was found between ovicidal efficiency and the base or degree of refinement of the oils examined. There was a tendency for oils deficient in ovicidal properties to be of relatively high viscosity but other factors, not represented in the characteristics determined, appear to be concerned in determining the ovicidal efficiency of oils. (3) The addition of high-boiling tar oils resulted in an increased ovicidal efficiency of the petroleum oil washes. (4) With the oils tested, no difference was found in the ovicidal efficiency between emulsions prepared by the two-solution oleic acid method and by the use of Bordeaux mixture."

The results of field trials of various tar-petroleum oil mixtures emulsified by the oleic acid method and of trials by means of 4–6–100 Bordeaux mixture on red currants, black currants, and several varieties of apples are reported

Vegetable oils applied at 6 percent proved ineffective against the eggs of the apple grain aphid.

Studies of contact insecticides, VII, W. C. O'Kane, W. A. Westgate, and L. C. Glover (*New Hampshire Sta. Tech. Bul. 58 (1934), pp. 35, figs. 24*).—This continuation of studies of contact insecticides (E.S.R., 70, p. 502) is presented in two parts. Part 1 (pp. 3–13), which is in continuation of earlier studies (E.S.R., 63, p. 154), considers the methods of expressing toxicity, much of the technical data being presented in table and chart form. Part 2 (pp. 14–33) reports upon the toxicity of nicotine, heptylic acid, and caproic acid to mosquito larvae (*Culex pipiens* L.), the details also being presented at length in table and plotted chart form.

A list is given of references to the literature.

[Lists of United States patents relating to insect traps], compiled by R. C. Roark (*U.S. Dept. Agr., Bur. Chem. and Soils, Pat. Lists, 1934, Nos. 1, pp. 8; 2, pp. 8; 3, pp. 4; 4, pp. 7; 5, pp. 8; 6, pp. 6; 7, pp. 4; 8, pp. 8; 9, pp. 5; 10, pp. 3; 11, pp. 8; 12, pp. 8*).—The 12 lists of United States patents issued from 1917 to 1933, inclusive, relate respectively to insect electrocutors, insect traps using artificial light, suction machines for catching insects, mechanically operated insect traps, reticulate fabric insect traps, fly vases, garbage can insect traps, traps for crawling insects, insect barriers for use on furniture, insect barriers for use on tree trunks, window and door screen fly traps, and machines for removing insects from plants. It is pointed out that the vast number (nearly 2,000,000) of patents issued since the establishment of the Patent Office makes it impossible to consider all patents even in such a restricted field as pest control. Since the life of a patent is 17 yr., the compilation includes all patents that were in force in December 1933.

Esters as repellents, W. Moore (*Jour. N.Y. Ent. Soc., 42 (1934), No. 2, pp. 185–192*).—In studies conducted at the New Jersey Experiment Stations, house flies and several blood-sucking Diptera were found to be repelled by unsaturated cyclic esters, including certain substances which are without odor to man. Acetates of terpin alcohols were in every case found superior to the corresponding alcohols.

Michigan termites or " white ants ", E. I. McDaniel (*Michigan Sta. Circ. 150 (1934), pp. 14, figs. 9*).—A revised and enlarged edition of Circular 134 (E.S.R., 63, p. 549), prepared because of the increasing number of complaints of injury by termites that were received from 50 or more localities in the Lower Peninsula during the preceding year.

Control of subterranean termites in dwellings (*Alabama Sta. Leaflet 1 (1934), pp. 4, fig. 1*).—A practical account of termites in dwellings, including prevention and means of control.

Green tomato bug, L. J. Newman and B. A. O'Connor (*Jour. Dept. Agr. West. Aust., 2. ser., 11 (1934), No. 1, pp. 101–112, figs. 8*).—A report is given of observations of the biology of the southern green stinkbug, its natural enemies—including the introduced egg parasite *Microphanurus megacephalus* Ashm. and control measures.

A note on Lygus pabulinus L., M. D. Austin (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 168–170, figs. 2*).—This note relates to the observations of the biology of the common green capsid of Great Britain.

A new species of Coreidae (Heteroptera) injurious to coconut in the Solomon Islands, W. E. China (*Bul. Ent. Res., 25 (1934), No. 2, pp. 187–189*).—Under the name *Amblypelta cocophaga* the author describes and presents notes on a new species of a coreid which attacks the inflorescence of the coconut palm in the Solomon Islands.

A new genus of Veliidae (Hemiptera), G. E. GOULD (*Jour. Kans. Ent. Soc., 7 (1934), No. 2, pp. 56–61, pl. 1*).—In this contribution from the Indiana Experiment Station the author erects the genus *Veloidea*, of which *Rhagovelia gigantea* (Gould) is the genotype.

The relation of time of cutting to leafhopper injury to alfalfa, H. H. JEWETT (*Kentucky Sta. Bul. 348 (1934), pp. 49–59, figs. 3*).—In cutting experiments with alfalfa for leaf hopper control in 1932–33, it was found that by delaying the first cutting to near full-blooming of the alfalfa, or to June 10–15, many eggs are destroyed in the first crop and there are fewer hoppers on the second crop and less injury. The leaf hoppers appear on alfalfa in considerable numbers about June 1 and commence laying their eggs on the first crop; they are most numerous about July 25 and decline in number after that date. When the alfalfa is cut during the last week of July injury is confined mainly to the second crop and there is very little injury to the third crop. The experiments prove that there is less loss from leaf hopper injury when the first crop is cut when in nearly the full-bloom stage and the second crop during the last week of July. If the alfalfa is not in nearly full-bloom stage on June 15 the cutting should not be delayed longer, since too many hoppers will be hatched after that date. It is pointed out that the results obtained are in agreement with the findings of Graber and Sprague of the Wisconsin Station (E.S.R., 71, p. 510).

The results of the tests of 1932–33 are summarized in detail in two tables.

Some Utah leafhoppers, G. F. KNOWLTON (*Canad. Ent., 66 (1934), No. 7, pp. 164–168, fig. 1*).—Contributing from the Utah Experiment Station the author lists species of Cicadellidae, identified largely by P. W. Oman (*Erythroneura* by R. H. Beamer), occurring in the State, together with the dates and localities of collection. In the dissections of adult and nymphal material of *E. ziczac* and *E. elegans*, collected at Logan, evidence was found, although comparatively rare, of internal parasitism, apparently by a species of *Pipunculus*.

A damsel bug, *Nabis ferus* L., was observed to attack readily both the adult and nymphal beet leaf hopper, *Opsius tenellus* (Baker), and some other species. A nearly mature larva of the convergent lady beetle was found to feed upon *Erythroneura* nymphs, 14 of which in the fifth instar were killed and their bodies largely completely consumed during a total elapsed period of 2.5 hr. It is thought that lady beetles and their larvae may be of some help in the control of leaf hoppers upon ornamental Virginia creepers and upon grapes.

A new species of Typhlocyba (Homoptera, Cicadellidae) injurious to prune in the Pacific Northwest, D. M. DELONG and R. H. DAVIDSON (*Ohio Jour. Sci., 34 (1934), No. 3, pp. 161, 162, figs. 3*).—Under the name *T. pruni* the authors describe a new cicadellid from a series of specimens collected at Parma, Idaho, and Opportunity, Wash., all taken in July and September from the cultivated prune.

The aphids of the elm and their migrations [trans. title], P. MARCHAL (*Min. Agr. [France], Ann. Épiphyties, 19 (1933), Nos. 4–5, pp. 207–329, pls. 3, figs. 52*).—The species of Aphididae attacking the elm are dealt with in connection with a 5-page list of references to the literature and two colored plates. In the migration studies *Eriosoma ulmi*, *E. lanigera*, and *Tetraneura ulmi*, for which the elm serves as the principal or definite host, have been largely used as types.

Mealy-bug wilt and green spot in Jamaica and Central America, W. CARTER (*Phytopathology, 24 (1934), No. 4, pp. 424–426*).—Observations made by the author in the fall of 1932 have led to the conclusions that mealybug wilt of

pineapple, due to the pineapple mealybug, is present in Jamaica and that the Smooth Cayenne has disappeared and the Red Ripley variety is becoming rare on that account. The Cheese Pine variety is considered unquestionably much more resistant to mealybug wilt than any other variety observed. Even with high populations of mealybugs this variety was vigorous and is apparently wilt resistant. Green spotting was encountered in Jamaica on several varieties. In Guatemala, where collecting was done under a wide variety of environments, no green spotting nor wilt was encountered, even though on the lowlands the pineapple mealybug was very common and on a variety (Cheese Pine) that in Jamaica showed green spotting. In Spanish Honduras green spotting was found only in one place and there the mealybug was rare; no typical wilt was observed.

The external anatomy of the red date scale Phoenicococcus marlatti Cockerell and its allies, F. S. Stickney (*U.S. Dept. Agr., Tech. Bul. 404 (1934), pp. 163, figs. 78*).—Following a brief introduction and an account of the host plants and geographical distribution, the author deals with the comparative morphology of coccids of the new tribe Phoenicococcini for which the subfamily Phoenicococcinae has been erected. Keys are given to the five genera of this tribe, namely, *Phoenicococcus* Ckll., *Palmaricoccus* n.g., *Halimococcus* Ckll., *Platycoccus* n.g., and *Thysanococcus* n.g. The author's study of a wide variety of material has given strong evidence that 11 species are related to it, all of which occur only on species of palms or of the genus *Pandanus*, considered by plant morphologists to be of the primitive stock from which palms arose. While none of the apparent relatives of the red date scale are known to occur in the United States, but are widely scattered through the tropical and subtropical belts of the world and subject to a considerable variety of climatic conditions, it is likely that one or more may be able to establish themselves as pests either of the date palm or some of the other palms so freely utilized as ornamentals in the United States.

In addition to the red date scale, the species considered include *Palmaricoccus attaleae* n.sp., *P. pritchardiae* n.sp., *P. nesiotes* Laing, *H. lampas* Ckll., *H. thebaicae* Hall, *H. borassi* Green, *Platycoccus tylocephalus* n.sp., *T. chinensis* n.sp., *T. pandani* n.sp., *T. squamulatus* n.sp., and *T. calami* n.sp.

The red date scale has been taken from 3 species of *Phoenix*, *Palmaricoccus pritchardiae* from 2 species of *Pritchardia*, *T. pandani* from 3 and possibly 4 species of *Pandanus*, and *T. squamulatus* possibly from 2 species of *Calamus*. The records for the remaining 8 species give no indication of other than single host species for each. It is pointed out that the number of species now known are too few, and their host records too meager, to warrant any definite statements concerning the comparative relationships of insect and host. The work concludes with a discussion of their relation to other coccids.

A list of 16 references to the literature is given.

Ear-worm injury in relation to date of planting field corn in central Virginia, W. J. Phillips and G. W. Barber (*Virginia Sta. Tech. Bul. 55 (1934), pp. 15, figs. 4*).—In experiments conducted in cooperation with the U.S.D.A. Bureau of Entomology with a view to determining if there be a period during which field corn can be planted in central Virginia in order to escape severe injury from the corn ear worm, plats of two common varieties of corn, Reid Yellow Dent and Boone County White, were grown at Charlottesville and at Richmond during a series of years. Plantings were made at intervals from April 20 to June 26, the data obtained from the plats being compared with similar data from cornfields grown by farmers under the usual conditions and planted on known dates. The loss caused was determined through counts made

of kernels destroyed and then the loss in weight of grain per ear of each plat of each planting date for each variety, and also for each of 100 representative ears taken from each observation field.

"It was found that the average number of kernels destroyed, and also the reduction in yield of grain, was least in the earliest planted plats and cornfields and greatest in those planted on the latest dates. No definite relationship was found to exist between the size of the cornfield and the degree of ear worm injury. Ears from the earliest planted corn usually weighed more than those from the latest planted fields."

It appears that while ear worms do not feed any more extensively in small ears than in the larger ones, the percentage of loss in weight of grain destroyed is greatest in small ears and least in the larger ones.

The data obtained are considered to warrant the conclusion that "considering only insect problems, the time to plant corn to escape with the least ear worm injury is between April 15 and May 15. Where, as in the vicinity of Richmond and southward, the southern cornstalk borer occurs in injurious abundance, plantings should be restricted to the first two weeks in May in order to reduce the damage by both ear worms and stalk borers. Insofar as ear worm injury is concerned, it is inadvisable to plant field corn in central Virginia after the middle of May."

The biology and distribution in France of the larval parasites of Cydia pomonella L., H. T. Rosenberg (*Bul. Ent. Res.*, *25* (*1934*), *No. 2*, *pp. 201–256*, *figs. 15*).—A report is given of the numbers of moths and parasites that emerged from collections of the codling moth made in France in the autumn of 1928 and during the autumn of 1929 and the winter of 1929–30. The areas surveyed, hibernation of the collections, and emergence records from 11 localities are presented and summarized, followed by notes on 18 hymenopterous and 2 tachinid parasite species reared.

Low percentages of parasitism of the larvae were found, and the author was led to conclude that predacious birds and the removal of larvae with the fruit crop must be important factors in the control of the pest in France.

A 4-page list of references to the literature is included.

On some moths injurious to citrus trees in Palestine, F. S. Bodenheimer and H. Z. Klein (*Hadar*, *7* (*1934*), *No. 1*, *pp. 8–10*, *figs. 6*).—Lepidoptera attacking citrus trees in Palestine include the citrus flower moth (*Prays citri* Mill.), the stub moth of citrus rootstocks (*Ephestia vapidella* Mn.), the rind-boring orange moth (*Crytoblabes gnidiella* Mill.), and the citrus inarch moth.

Some biological and economic aspects of the gall midges, H. F. Barnes (*Sci. Prog.* [*London*], *29* (*1934*), *No. 113*, *pp. 73–86*).—In part 1 of this contribution from the Rothamsted Experimental Station the author deals with the biology of the Itonididae and in part 2 with their economic importance and control.

Electrocution a new aid in the preparation of mosquito mounts, C. P. Coggle (*Pub. Health Rpts.* [*U.S.*], *49* (*1934*), *No. 28*, *pp. 824–826*, *figs. 2*).—The author has found that by the use of the method here described the mosquito can be mounted with the wings spread in a flight position and the legs extended.

Two new species of North American Exoprosopa (Bombyliidae; Diptera), R. H. Painter (*Jour. Kans. Ent. Soc.*, *7* (*1934*), *No. 2*, *pp. 68–70*).—The two bombyliid flies, *Exoprosopa anomala* from Texas, Arizona, and New Mexico, and *E. xanthina* from California, are described as new in this contribution from the Kansas Experiment Station.

Ox warble flies, R. S. MACDOUGALL (*Highland and Agr. Soc. Scot. Trans., 5 ser., 46 (1934), pp. 1–90, figs. 32*).—This extended account of ox warble flies includes a discussion of experimental control work conducted in Scotland from 1930 to 1933, the details of which are presented in tabular form.

"The work of the past few years has put beyond all possible doubt the value of Polvo or suchlike derris preparation as a sure means of destruction of warble larvae, easy to apply, harmless to the treated cattle, and economical."

Action of X-rays on the eggs of Calliphora, C. M. SCOTT (*Roy. Soc. [London], Proc., Ser. B, 115 (1934), No. B 792, pp. 100–121, pl. 1, figs. 6*).—In the course of the studies here reported the relationship between the sensitivity to the lethal action of X-rays of the egg of *C. erythrocephala* and the degree of embryological development of the egg has been shown. "The sensitivity of the egg decreases with age, but the loss of sensitivity follows an irregular course. The variations in sensitivity can be explained by the accompanying changes in the embryological development of the egg. The evidence suggests that X-rays exert their action on the complete cell unit rather than on the cell nucleus exclusively. The lethal effect of X-rays on the calliphorine egg is not an immediate effect. The shape of the characteristic curve of the lethal action of X-rays on calliphorine eggs at various stages of development has been defined."

In an appendix an account is given of a method of preparing microscopic sections of the eggs of *C. erythrocephala*, by D. Kilgour (pp. 119, 120).

A case of myiasis, due to Calliphora erythrocephala, occurring in man, W. H. HARVEY (*Parasitology, 26 (1934), No. 2, pp. 306, 307*).—The case of myiasis due to *C. erythrocephala* here reported is believed to be unique, no similar records having been found after a search of the literature.

***Investigations of the life history and combat of the cherry fruit fly* Rhagoletis cerasi L., II** [trans. title], R. WIESMANN (*Landw. Jahrb. Schweiz, 48 (1934), No. 3, pp. 281–338, figs. 13; Fr. abs., pp. 336, 337*).—This is a further contribution (E.S.R., 70, p. 658) on the biology and control of the cherry fruit fly in Switzerland, presented in connection with a list of 28 references to the literature.

Digestion in blowfly larvae, Phormia regina Meigen, used in the treatment of osteomyelitis, F. FLETCHER and J. G. HAUB (*Ohio Jour. Sci., 33 (1933), No. 2, pp. 101–109, fig. 1*).—In a study of digestion in blowfly larvae, the only enzymes found present in the various portions of the alimentary tract were amylase, lipase, trypsin, and erepsin. "A method was devised to raise flies from egg to adult aseptically by repeated heatings of the media at low temperatures. It was demonstrated that some food factor is destroyed when the media was autoclaved, that this factor is somehow replaced when this same autoclaved media is recontaminated, and that sterilizing at lower temperatures does not destroy this factor at all. By this method a check was provided on enzymic determinations in contaminated larvae, and the only significant difference obtained was in the test for invertase; it was found present in the contaminated larvae but not in the larvae reared aseptically, which would seem to indicate that the hydrolysis of sucrose was not caused by the enzyme but probably by bacteria."

A list is given of 24 references to the literature cited.

A revision of the genus Anastrepha based on a study of the wings and on the length of the ovipositor sheath (Diptera: Trypetidae), C. T. GREENE (*Ent. Soc. Wash. Proc., 36 (1934), No. 6, pp. 127–179, pls. 5, figs. 4*).—This revision of the dipterous genus *Anastrepha*, usually referred to as fruit

flies because their larvae live in the pulp of fresh fruits, recognizes 54 species, of which 16 are described as new to science. Tables are given for the identification of both males and females, and a list of 36 references to the literature is included.

Control of the cabbage root fly, E. E. Edwards (*Jour. Min. Agr.* [*Gt. Brit.*], *41* (*1934*), *No. 2, pp. 154–161*).—Details of experimental work with the cabbage root fly in 1932 and 1933 are presented in tabular form. The experiments have shown the use of corrosive sublimate, applied at a strength of 1 oz. in 8 gal. of water, to be the most successful means at present known of reducing the damage caused to cruciferous plants by this pest. The treatment consists in the application to each plant of about 0.25 pt. of the solution in such a manner as to flood the soil evenly around the base of the plants on three occasions at 10-day intervals, starting 4 days after transplantation.

The loganberry cane maggot, L. N. Staniland (*Jour. Min. Agr.* [*Gt. Brit.*], *41* (*1934*), *No. 2, pp. 151–153, pl. 1*).—Investigations made in June 1933 of a peculiar wilting of tips of young canes of loganberry in a plantation in South Devon led to the discovery that it is caused by the raspberry cane maggot, a serious pest in the United States and Canada, reported by Theobald in 1912 and 1913 (E.S.R., 30, p. 53; 34, p. 651) as causing similar injury in England.

Further studies on the biology of the pigeon fly, Pseudolynchia maura Bigot (Diptera, Hippoboscidae), M. J. Prouty and G. R. Coatney (*Parasitology, 26* (*1934*), *No. 2, pp. 249–258*).—This contribution, which records information on the biology of the pigeon fly, with special reference to the tropisms, supplements that of Coatney (E.S.R., 67, p. 155) previously noted.

Plant pest control: The outbreak of white grubs in Minnesota, A. A. Granovsky (*Minn. Hort., 62* (*1934*), *No. 6, pp. 113, 118, figs. 3*).—This is a practical contribution from the Minnesota Experiment Station.

The control of white grubs, G. N. Wolcott (*Internatl. Sugar Jour., 36* (*1934*), *No. 425, p. 180*).—It is pointed out that the major factor in the control of white grubs not only in Barbados but in Jamaica, and more recently in Puerto Rico, is the agua or giant toad, *Bufo marinus* L. (E.S.R., 64, p. 354). The effectiveness of this toad in the control of white grubs is said to be most notable in Puerto Rico, where the pest has ceased to be a problem.

Prothetely in Epilachna corrupta Muls. (Coleop.), B. J. Landis and R. H. Davidson (*Ohio Jour. Sci., 34* (*1934*), *No. 3, pp. 147–149, figs. 2*).—A brief account is given of prothetely in the Mexican bean beetle, based upon observations made in the course of laboratory rearings and field collections at Columbus extending over a period of 3 yr. It is estimated that one larva with wing pads had appeared for each 10,000 larvae handled at Columbus during 1932 and 1933. Probably 25 individuals have been observed in all and in September 1933 five larvae with wing pads were at hand at one time. The wide seasonal and environmental ranges under which these unusual forms have been observed have led the authors to conclude that something other than environmental factors may be responsible for their appearance.

Notes on the larva and larval habit of Isohydnocera curtipennis (Newmn.) (Coleoptera, Cleridae), C. W. Sabrosky (*Jour. Kans. Ent. Soc., 7* (*1934*), *No. 2, pp. 65–68*).—This contribution from the Kansas Experiment Station reports upon the larval habits of the clerid beetle, *I. curtipennis*, the adult of which was observed to emerge from a large gall of the *Solidago* gallmoth, probably *Gnorimoschema gallaesolidaginis* Riley. Examination of the gall led to the conclusion that it is a case of true endoparasitism in which the adult is free-living and the larva parasitic.

***The biotic constants of Tribolium confusum* Duval**, R. N. Chapman and L. Baird (*Jour. Expt. Zool., 68 (1934), No. 2, pp. 293–304, figs. 3*).—From studies conducted at the Minnesota Experiment Station, the authors conclude that the use of the confused flour beetle for studies in population trends is justifiable in that its biotic constants are sufficiently exact to warrant the use of mathematical formulas for calculating the potential trends of the population.

The lethal effect of low temperatures on the various stages of the confused flour beetle, R. H. Nagel and H. H. Shepard (*Jour. Agr. Res.* [*U.S.*], *48 (1934), No. 11, pp. 1009–1016, fig. 1*).—Contributing from the Minnesota Experiment Station, the authors report upon a study conducted in which data were obtained that show the number of hours of exposure required to produce 50- and 100-percent mortality, with the temperatures ranging from 12° to −18° C.

With the eggs placed in 6 groups according to age—1–24, 24–48, 48–72, 72–96, 96–120, and 120–132 hr., the resistance to cold was found to be greatest in the fourth age group, 72–96 hr. With the larvae placed in 3 age groups—unfed larvae 1–12 hr. old, half-grown, and full-grown larvae, the full-grown group was the most resistant, although the difference was pronounced only at 7°.

"The mortality of the pupae was based on the percentage of emergence of the adults. The adults ranged in age from 1 to 5 mo., and those not injured sufficiently to die as a result of exposure to low temperatures were counted as survivors. The figures for 50-percent mortality show that the adults were more resistant than the other stages at 7°; at −6° the larvae were about as resistant as the adults; and at −12° the eggs were the most resistant. The figures for 100-percent mortality show that all stages of the insect can be killed at 7° if exposed at that temperature for 25 days, but if the temperature is lowered to −6° only 24 hours' exposure is necessary."

The saw-toothed grain beetle as a rice-mill pest, H. H. Schwardt (*Arkansas Sta. Bul. 309 (1934), pp. 14*).—Studies made of the rate of larval growth of the saw-toothed grain beetle in rice products, the effect of moisture content of food, and experiments with moisture content and temperature controlled are presented in detail in three tables. This beetle, which is a pest in rice mills chiefly because of its occurrence in polished rice, cannot grow to maturity in whole polished rice. It is pointed out that the large numbers of beetles often found in this product in mills have developed in the rice byproducts and migrated to the polished rice. The pest develops most rapidly in rice polish, while rice bran, ground brown rice, ground rough rice, and whole brown rice, in the order named, are less favorable for development. "Rice polish and rice bran are the products which attract the insect to rice mills and permit it to multiply to outbreak proportions. While able to develop in foods of very low moisture content, those containing from 11 to 17 percent of water are most conducive to rapid growth of the larvae.

"Brief studies on vitamin requirements indicate that the vitamin B complex, of which rice polish is a rich source, is probably an indispensable item in the larval diet. Vitamin A deficiency appears to cause an increase in the percentage of larval mortality.

"Rice mills kept free from small loose accumulations of byproducts, especially polish and bran, would be less likely to develop outbreaks of the saw-toothed grain beetle. A handful of rice polish left accessible to these insects can produce enough beetles to infest and ruin the value of several bags of polished rice.

"Polished rice stored in a tight building removed several hundred feet from the mill and used exclusively for the storage of polished rice, should remain entirely free from infestation. When infested polished rice is cleaned to

remove insects, the cleanings should be burned at such frequent intervals as to insure the death of all insects it contains."

The pecan weevil (*Alabama Sta. Leaflet 4 (1934), pp. 4, fig. 1*).—A practical account.

Apiary inspection in Pennsylvania, H. B. Kirk (*Penn. Dept. Agr. Bul. 521 (1934), pp. 16, figs. 16*).—A report upon apiary inspection in Pennsylvania where there are approximately 30,000 beekeepers owning 195,000 colonies of bees, the average crop produced annually amounting to about 1,750,000 lb. of honey valued at $300,000. It is pointed out that this does not include a much greater value derived from the bees as pollinizers of fruit and other blossoms.

On the biology of Anagrus atomus (L.) Hal.: An egg parasite of the leaf-hopper Erythroneura pallidifrons Edwards, E. I. MacGill (*Parasitology, 26 (1934), No. 1, pp. 57–63, figs. 11*).—The author finds that this egg parasite of a leaf hopper reproduces parthenogenetically for at least the greater part of the year. Descriptions are given of two larval stages. "More than one egg may be laid in a single host egg and these eggs may hatch, but only one of the *Anagrus* larvae reaches maturity. The development of *A. atomus* takes about 16 days. The species is multivoltine."

***Ixodes ricinus* in relation to its physical environment: The influence of climate on development**, J. MacLeod (*Parasitology, 26 (1934), No. 2, pp. 282–305, figs. 6*).—This contribution reports laboratory experiments upon the effects and intereffects of different physical factors in the environmental complex upon the development of the gorged castor-bean tick, the only tick of major importance in Great Britain.

The hay itch mite, Pediculoides ventricosus (Newport) (Acarina, Pediculoididae) in South Australia, D. C. Swan (*Jour. Dept. Agr. So. Aust., 37 (1934), No. 10, pp. 1289–1299, figs. 7*).—The author records the occurrence of the hay or straw itch mite in South Australia, considers its biology, discusses its importance, and makes suggestions for its prevention in haystacks.

It is stated that this mite had not been reported from Australia, although isolated by H. Womersley for the first time in June 1931 from chaff at Fremantle, Western Australia.

A list is given of 18 references to the literature.

The bionomics of the bulb-scale mite, Tarsonemus approximatus Banks var. narcissi Ewing, W. E. H. Hodson (*Bul. Ent. Res., 25 (1934), No. 2, pp. 177–185, pls. 2*).—Following an introduction and technical description, the author considers the symptoms of attack in the dormant bulb, in the forced bulb, and in bulbs in the field; technic for study of the life history; parthenogenesis; duration of the life cycle; seasonal biology; and control measures. In an appendix, W. C. Moore presents a note on a probable early record of a *Tarsonemus* on narcissus in England.

ANIMAL PRODUCTION

[Experiments with livestock in Georgia] (*Georgia Sta. Rpt. 1933–34, pp. 19, 20, 21–25, 26, 29, 30, figs. 2*).—Data obtained in experiments with livestock are reported on the sweetpotato as a hardening feed for swine, protein supplements for swine, corn and cottonseed meal in beef-fattening rations, comparing ground and whole ear corn in steer-fattening rations, comparing common and good feeder steers, the use of oils and fats in the diet by ruminants and nonruminants, the making of silage in trench silos from unchopped material, and pimiento and egg yolk color studies.

[Experiments with livestock in Texas] (*Texas Sta. Rpt. 1933, pp. 26, 27, 29–39, 40, 41, 104–106, 108, 109, 181, 182, 202, 203, 205, 206*).—Data obtained in

studies with sheep and goats are reported on the adaptation of Corriedale sheep to southwest Texas conditions, by J. M. Jones, B. L. Warwick, W. H. Dameron, and D. A. Spencer; alfalfa hay v. sumac sorghum fodder and silage as roughages when fed with and without pulverized oyster shell for fattening lambs, by W. L. Stangel and J. M. Jones; cottonseed in lamb fattening rations, by J. M. Jones, J. J. Bayles, W. H. Black, and J. H. Jones; feeding unground v. ground grain sorghum heads, and feeding whole cottonseed v. cottonseed cake, by J. M. Jones, C. H. McDowell, and J. H. Jones; relation of age of animal to fineness of wool and mohair, by J. M. Jones and Warwick; utilization of Angora kid skins, by Warwick; pasture studies at College Station, by Warwick and E. B. Reynolds; grades and shrinkages of Texas wool and mohair, by S. P. Davis and J. M. Jones; bloodless castration of lambs, by J. M. Jones, Dameron, and O. L. Carpenter; and tagging bred Rambouillet ewes, by Dameron, J. M. Jones, and Davis.

Tests with beef cattle yielded information on sorghum roughages and cottonseed in cattle-fattening rations, by J. M. Jones, R. E. Dickson, and J. H. Jones; the preparation of milo grain for fattening baby beeves, by J. M. Jones, F. E. Keating, and J. H. Jones; feeding steers on ground hegari heads, ground hegari stover, and cottonseed meal, limestone flour in a grain sorghum fattening ration, steer gains on Sudan pasture with and without cottonseed cake, and Sudan grazing v. Sudan grazing and cottonseed cake, by J. M. Jones, R. A. Hall, and J. H. Jones; full v. limited feeding of concentrates, influence of cottonseed in limited grain rations, and fattening average v. stunted yearling steers, by J. M. Jones, Bayles, and J. H. Jones; cottonseed in cattle-fattening rations, and rice bran as part of the grain ration in cattle fattening, by J. H. Knox, J. H. Jones, Black, and J. M. Jones; grazing semi-improved pastures in east Texas, and pulverized oyster shell in the ration of yearling steers, by J. H. Jones, Black, P. R. Johnson, and J. M. Jones; creep-feeding range calves, by J. H. Jones, Black, J. B. Finley, and J. M. Jones; and spineless cactus (*Opuntia ellisiana*) for cattle, by Dameron and Carpenter.

The hog work yielded results on the vitamin A requirements for fattening pigs, by F. Hale and G. S. Fraps; the value of Sudan grass and oats pasture for fattening pigs, the average daily gains and feed required per 100 lb. of gain by pigs fed in periods of wide climatic differences, calcium requirements of growing and fattening pigs when fed grain rations balanced with cottonseed meal, the method of feeding grain sorghum to swine, self-feeding brood sows throughout the gestation and lactation periods, and method of feeding wheat and barley to fattening swine, all by Hale; fattening hogs on west Texas feeds, by Hale and D. L. Jones; and curing and storing pork in west Texas, by Hale, R. W. Snyder, and D. L. Jones.

Results obtained in poultry studies are reported on the vitamin A requirements for chickens, by R. M. Sherwood and Fraps; lime-phosphoric acid requirements of fowls, and effects of feeds on storage quality of eggs, both by Sherwood; and effect of feed on leg disorders in chicks, by Sherwood and J. R. Couch.

The digestibility of brown alfalfa hay, sesame meal, and artichoke silage as determined for ruminants, A. H. Folger (*California Sta. Bul. 575 (1934), pp. 8*).—Using the methods described in Bulletin 409 (E.S.R., 56, p. 261), the digestibility of three feeds was determined in trials with wether sheep.

Stack-burned "tobacco" or brown alfalfa hay was approximately equal to average alfalfa hay in nutritive value. The excellent results ascribed to this hay are probably due to its greater palatability and consequent greater consumption. The sesame meal was about equal to average prime cottonseed

meal, being higher in all nutrients except carbohydrates. This feed contained 35.8 percent of digestible protein and 77.2 percent of total digestible nutrients. Sesame meal and cottonseed meal were equally palatable. Artichoke silage, a byproduct feed, was essentially similar to corn silage. It was slightly lower in total digestible nutrients, but because of its origin was probably a more economical feed.

Commercial feeding stuffs—report on inspection, 1933, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 362 (1934), pp. 537–654+XXXIII–LVIII*).—This is the usual report of the guaranties and analyses of 1,299 feeds examined during the calendar year 1933 (E.S.R., 69, p. 698).

Influence of calcium phosphorus intake on bovine blood, J. E. GREAVES, E. J. MAYNARD, and W. REEDER (*Jour. Agr. Res. [U.S.], 48 (1934), No. 11, pp. 1033–1041*).—At the Utah Experiment Station 5 lots of 8 steers each, averaging 585 lb. per head, were fed for 150 days on a basal ration of pressed beet pulp, beet molasses, alfalfa hay, and salt. This ration was supplemented in 4 of the lots with cottonseed cake, steamed bone meal, mill-run bran, and ground barley, respectively. Calcium and phosphorus analyses were run on blood samples at monthly intervals.

The initial values per 100 cc of blood serum and plasma were 12.3 to 13.1 mg of calcium and 2.4 to 3 mg of inorganic phosphorus. All of the supplements increased the inorganic phosphorus of the blood to about 5 mg per 100 cc of blood serum. This value was lowest in the lot receiving barley and highest in the lot receiving bone meal. Little, if any, effect was shown by the addition of these supplements on the blood calcium. A low negative correlation was found between the inorganic phosphorus and the calcium of the blood, but there was a close correlation between the phosphorus intake and the inorganic phosphorus of the blood.

Sunrise kafir versus Sumac cane as a forage for wintering beef cattle, O. S. WILLHAM ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 54 (1934), pp. 14–16*).—Two lots of six Hereford cows each were fed from February 3 to April 15 on 2 lb. of cottonseed cake per head per day. In addition lot 1 received all the ground Sunrise kafir fodder and lot 2 all the ground Sumac cane fodder they would consume. The cows averaged 827 lb. per head at the start of the test.

The cows in lot 1 gained an average of 154.2±8 lb. per head and those in lot 2, 97.4±12 lb. per head during the test. The feed consumption was practically the same in both lots. The cows in lot 1, however, required 98.6 lb. of cake and 809.7 lb. of kafir per 100 lb. of gain, while those in lot 2 needed 153.3 lb. of cake and 1,249.6 lb. of cane for the same gain. These results show a significant difference in the two fodders.

Feeding, docking, and castrating spring lambs, J. C. GRIMES, W. E. SEWELL, and G. J. COTTIER (*Alabama Sta. Circ. 69 (1934), pp. 4*).—A group of 417 lambs fed grain while suckling their dams on pasture weighed 3.7 lb. more per head than a group of 412 lambs that were raised on their mothers' milk and pasture. The grain-fed lambs sold for 80 ct. more per 100 lb. and returned 24 ct. more per head than the lambs receiving no grain.

A group of 328 lambs that were docked and all buck lambs castrated averaged 3.6 lb. less per head when sold than a group of 335 lambs that were neither docked nor castrated. The first group sold for 18 ct. more per 100 lb., but returned 14 ct. less profit per head than the second group.

Feeding methods and rations for fattening lambs, P. S. JORDAN and W. H. PETERS (*Minnesota Sta. Bul. 306 (1934), pp. 39*).—The results obtained over a period of 8 yr. in an effort to secure dependable information on the

selection of feeds and methods of feeding fattening lambs in experiments at the West Central Substation have been compiled in this bulletin. Many of these results have been noted in previous publications (E.S.R., 65, p. 62).

The authors conclude that the fattening of thin purchased lambs during the winter months was most profitable when the operation was a part of the production plan of a farm in which a large part of the acreage was suitable to growing feed crops. The feeding of two groups of lambs each winter was highly desirable since it kept the equipment in use for 6 or 8 mo. each year. The prevailing market price trend, the success of the feeder in selecting low-cost rations that produced a satisfactory finish in from 70 to 90 days, and the use made of the manure as fertilizer were the most important factors affecting the profit of the enterprise.

Some factors affecting the cost of raising pigs to weaning age, J. C. Grimes, W. E. Sewell, and G. J. Cottier (*Alabama Sta. Circ. 68 (1934), pp. 4*).—Based on the records of 147 litters of pigs farrowed and raised on the station farm over a period of 6 yr., it was found that the average number of live pigs per litter was 8. Of these an average of 5.8 pigs was weaned, showing a loss of 27.5 percent during the suckling period. The pigs were practically all purebred Duroc-Jerseys and Poland Chinas or crosses of the two breeds.

It required an average of 915 lb. of concentrates to raise the average litter to weaning age. In litters of two 448 lb. of feed were required to raise a pig to weaning age, while in litters of nine the requirement was only 110 lb. The average weight of pigs when weaned at 8 weeks of age was 27.2 lb. per head.

Sweet potatoes as a feed for swine, F. R. Edwards and Z. A. Massey (*Georgia Sta. Bul. 181 (1934), pp. 19, figs. 3*).—Continuing these studies of feeds for swine (E.S.R., 65, p. 161), it was found that sweetpotatoes when fed with protein and mineral supplements in dry lot produced unsatisfactory gains as compared with corn. When fed with a limited amount of corn sweetpotatoes gave good results. In dry lot sweetpotatoes produced gains of 0.3 lb. daily when supplemented only with minerals, 0.7 lb. when a protein supplement was added, and 1.3 lb. when a limited amount of corn was fed.

Grazing sweetpotatoes gave better results than feeding them in dry lot. This crop made better growth under dry conditions and gave more grazing under normal conditions than did corn. When supplemented with a one-third or one-half full ration of corn plus proteins and minerals, sweetpotatoes produced as good gains as did corn when both were grazed. Sweetpotatoes were superior to corn in overcoming the softness of fat in hogs.

A study of use of rice by-products for feeding swine and effects on quality of pork, E. Martin (*Arkansas Sta. Bul. 303 (1934), pp. 36*).—Continuing this series of studies (E.S.R., 66, p. 562), it was concluded that rice bran, rice polish, and brewers' rice were low in protein and should be supplemented with good quality protein-rich feeds. Rice polish and brewers' rice were satisfactory for fattening pigs, but rice bran contained too much fiber to give best results. Rice bran and rice polish were both high in fat, while brewers' rice was low in this respect.

The pigs weighing 85 lb. made more satisfactory gains on rice polish and rice bran both in dry lot and on pasture than did pigs weighing from 30 to 50 lb. at the beginning of the feeding period. Rye pasture aggravated the tendency of both of these feeds to cause scouring in young pigs. In most cases rice polish had a higher feeding value than rice bran. Brewers' rice and tankage were slightly superior to corn and tankage for fattening self-fed pigs, and when fed to soft hogs hardening was faster on brewers' rice than on corn. Soft carcasses were produced by feeding rice bran or rice polish supplemented with tankage. When pigs made rapid gains during a 6- to 8- week period on a

ration of rice polish and tankage, finishing for 6 weeks on brewers' rice or corn with tankage failed to produce uniformly hard carcasses. Rice bran varied in quality due to changes in fiber content.

The feeding quality of rice polish was not improved by the addition of 15 percent of alfalfa meal in a self-fed ration, by alfalfa hay, or by a mineral mixture high in ground limestone and containing iron sulfate. The small amount of rice hulls in the polish was not responsible for the poor feeding results. Rice polish could be fed to the breeding herd without producing soft pork in the pigs developed if they were finished on a ration that produced hard pork.

The results show that in order to utilize rice products to the greatest extent hogs should be fattened in two periods, with rice bran or rice polish at the beginning, followed by at least 8 weeks on hardening feeds.

Breeding a low producing strain of Single Comb White Leghorns, G. O. HALL (*Poultry Sci., 13 (1934), No. 2, pp. 123–127*).—In this paper from the [New York] Cornell Experiment Station the author explains how, by a simple system of selecting and mating which avoids close inbreeding, a strain of birds can be produced in which the production, mortality, age at first egg, fertility, and hatchability will not change materially over a period of 15 yr. A comparison of the production records of a low-line and a high-line strain of birds gave a direct measure of the influence of heredity upon production.

Growth of White Leghorn chicks, G. D. BUCKNER, W. M. INSKO, JR., and J. H. MARTIN (*Poultry Sci., 13 (1934), No. 2, pp. 110–115, figs. 2*).—The Kentucky Experiment Station investigated three methods of raising incubator-hatched chicks (E.S.R., 71, p. 685) in order to determine the most satisfactory method of calculating the rate of growth.

Three different methods of calculating growth data were examined. The first method consisted of calculating the average weight of all the pullets and cockerels alive on each weigh day during the test. In the second method the average weight was calculated for all the pullets and cockerels alive on each weigh day, excluding from the averages the preceding weighings of those that died or were removed for analyses. The third method consisted of calculating the average biweekly weights of only those pullets and cockerels that survived the experiment. The differences between the means for any two lots calculated by any of the three methods were slight.

Growth of chickens as a function of feed consumption, H. W. TITUS, M. A. JULL, and W. A. HENDRICKS (*Jour. Agr. Res. [U.S.], 48 (1934), No. 9, pp. 817–835, figs. 10*).—In order to study the relationship between the weight of feed consumed by a growing animal and the resulting gain in live weight, the U.S.D.A. Bureau of Animal Industry fed 7 pens of males and 7 pens of females of Rhode Island Red × Barred Plymouth Rock breeding at different levels of feed intake, including ad libitum and 6 lower levels, for a 52-week period. The weight of feed consumed and the average live weight of the chicks were obtained at the end of each week.

A mathematical analysis of the data indicated that the equation of the curve of diminishing increment, $W=A-BR^F$, in which W is the live weight after the consumption of any quantity of feed, F; A is the maximum live weight attainable on a given level of feed intake; B the maximum gain possible under the same conditions; and R, the Spillman ratio, is the inverse ratio of the gains in live weight resulting from any two successive units of feed consumed, accurately described the relationship between live weight and cumulative feed consumption. The relationship between the Spillman ratio and the level of feed intake was accurately expressible by the equation

$$ln \frac{y}{a-y} = k(x-b),$$

in which y equals the Spillman ratio, x equals the relative level of feed intake, and a, k, and b are constants. The relationship between the maximum gain possible and the level of feed intake could be fairly accurately expressed by the equation

$$y = a - b\epsilon^{-kx},$$

in which y equals the total gain possible, x equals the relative level of feed intake, and a, b, and k are constants.

On the higher absolute levels of feed intake the males studied were more efficient in feed utilization for growth, while on very low absolute levels the opposite was true. As a result of this study it is recommended that in comparative feeding tests all groups be fed at a level of feed intake equal to 70 percent of an approximation of the idealized ad libitum feed consumption.

The normal development of the leg bones of chickens with respect to their ash content, H. M. HARSHAW, J. C. FRITZ, and H. W. TITUS (*Jour. Agr. Res.* [*U.S.*], *48* (*1934*), *No. 11, pp. 997–1008, figs. 4*).—The U.S.D.A. Bureau of Animal Industry designed this study to determine the normal development of the leg bones of chicks of different breeds raised under favorable conditions on a grass range. Groups of 350 birds each of the Rhode Island Red and White Leghorn breeds were fed the same basal ration and were kept under similar conditions. On the day of hatching and at 1-week intervals thereafter up to the twentieth week determinations were made of the ash in the moisture- and fat-free femur, tibia, and metatarsus with and without the cartilages of representative birds from each group. The calcium and inorganic phosphorus of the blood serum and of the ash of the tibias were also obtained.

The calcium content of the blood showed no significant change with increasing age, except for a marked increase in pullets just before they started to lay. The inorganic phosphorus showed a decrease after the fourteenth week. X-rays indicated an earlier calcification of the epiphyses of the bones of females than of males and of White Leghorns than of Rhode Island Reds. The calcium and phosphorus contents of the ash of the tibias showed no significant difference, nor were the sex differences significant. The calcium-phosphorus ratio was low on the day after hatching, but increased to about 2:1 in all cases. The diaphysis of the long bones of both sexes tended to have a constant ash content from the fifth to the twentieth week. The ash content of the diaphysis with its cartilages tended to be higher for females than for males and higher for Leghorns than for Rhode Island Reds.

It was concluded that the tibia is the most satisfactory bone to use in studying the ash content of the bones of chickens. In preparing the bone for ashing it is recommended that the epiphyseal cartilages and the periosteum be removed.

Calcium and phosphorus in the development of the turkey embryo, W. M. INSKO, JR., and M. LYONS (*Jour. Nutrition, 6* (*1933*), *No. 6, pp. 507–513, figs. 3*).—The Kentucky Experiment Station made a study of the embryonic growth of turkeys as measured by wet weight, dry weight, and ash content; by the percentage of moisture; by the growth cycles; and by the calcium and phosphorus content of the embryo. Bronze turkey eggs were removed from the incubator at 24-hr. intervals and stored in a refrigerator until analyzed.

Until the twelfth day of incubation the daily increase in wet weight, dry weight, and ash content was very small. After this period the time increments of growth increased noticeably. There was a relatively slow increase in calcium and phosphorus content until the seventeenth day, and the calcium-phosphorus ratio was less than 1 until the nineteenth day, after which it exceeded 1.

There were three distinct phases or cycles in the growth of the turkey embryo, with definite periods of retardation between the ninth and tenth and between the nineteenth and twentieth days. These periods of retardation were also noticeable in the calcium and phosphorus content. Certain correlations are suggested between these periods of retardation and the change in the type of food metabolized. It was found that the calcium content of the embryo may be used as a measure of growth if the yolk material drawn into the body cavity is removed before analysis.

Simplified rations for farm chickens, D. F. KING and G. A. TROLLOPE (*Alabama Sta. Circ. 66 (1934), pp. 10*).—Continuing these studies (E.S.R., 66, p. 859), it was found that rations gave satisfactory results when built around a mineral mixture of bone meal, marble grit, and salt 5:5:1 with skim milk to drink, to which was added either yellow corn meal, yellow corn meal and wheat shorts, white corn meal and wheat shorts, or yellow corn meal and ground oats.

Pullets fed these simplified diets did not grow as fast as those fed more complex rations, but they grew over a longer period and in some cases attained a greater weight. Rations composed of white corn meal and the mineral mixture with skim milk, yellow corn meal, wheat shorts or ground oats, meat scrap, bone meal, salt, and water did not produce good growth, and the mortality was high. Wheat shorts proved to be superior to ground oats. Skim milk as a sole protein supplement gave good results with the simplified diets, while meat scrap used in the same manner was unsatisfactory.

The practical application of these results is discussed.

The biological value of rations containing fish meal, J. L. ST. JOHN, J. S. CARVER, O. JOHNSON, S. A. MOORE, and H. GERRITZ (*Jour. Nutrition, 7 (1934), No. 1, pp. 13–26, fig. 1*).—The Washington Experiment Station made a study of the supplementary value of herring fish meal fed at different levels in an all-mash ration for growing White Leghorn chicks.

The biological value of these rations was found to be high but decreased somewhat as the level of total protein increased. Chicks receiving a ration containing 15 percent of total protein showed a slightly more efficient use of the protein based on gain per gram of protein consumed. An increased rate of growth accompanied an increased percentage of protein in the ration. Of the protein levels used, the 15 percent level appeared to be the most efficient on the basis of growth, feed and protein utilization, and biological value.

Rice by-products in the poultry ration for egg production and growth, R. M. SMITH (*Arkansas Sta. Bul. 304 (1934), pp. 20*).—Continuing these studies (E.S.R., 66, p. 565), it was concluded that rice byproducts were not satisfactory substitutes for corn, wheat, and oats in laying rations, except when supplemented with cod-liver oil, yellow corn, or green feed. Brewers' rice was not a satisfactory substitute for cracked yellow corn or yellow corn meal. Rice bran and rice polish could be used to replace equal amounts of wheat bran, wheat gray shorts, and pulverized oats. Rice polish was equally as valuable as pulverized oats.

Rice byproducts had no consistent influence on the hatchability or fertility of eggs. Neither cod-liver oil, yellow corn meal, nor green feed increased the hatchability of eggs produced on rice rations. Rice byproducts did not influence the weight of eggs or the body weight of birds. Eggs produced on rice rations were suitable for cold storage purposes. Rice byproducts produced normal growth when supplemented with animal protein and cod-liver oil. If properly supplemented with vitamin A, rice byproducts were satisfactory substitutes for corn, wheat, oats, and the products of these grains in

laying and growing rations of chickens when the price of feeds justified the substitution.

Wheat and wheat by-products for laying hens, W. C. Tully (*South Dakota Sta. Bul. 284 (1934), pp. 8, fig. 1*).—A series of three experiments was conducted to determine whether ground wheat could be substituted in laying mashes for the more commonly used bran and middlings.

It was found that 30 percent of ground red durum wheat was as satisfactory as 15 percent each of bran and flour middlings in the mash portion of a grain and mash ration for laying pullets. Under similar conditions 15 percent of either wheat bran or wheat flour middlings substituted for one-half of the ground wheat gave no improvement in egg production.

A number of rations using ground wheat are suggested that are satisfactory for egg production. Their use depends upon the price and availability of the feeds. These rations were not satisfactory as chick-starting mashes.

Effect of concentrations of nicotine on growth and development.—II, Growth and development of chicks as influenced by the addition of ground tobacco to the ration, J. E. Hunter, D. E. Haley, and H. C. Knandel (*Poultry Sci., 13 (1934), No. 2, pp. 91–94, figs. 3*).—Continuing this study at the Pennsylvania Experiment Station (E.S.R., 65, p. 382), the results showed that the feeding of ground *Nicotiana rustica*, a strain of tobacco having a nicotine content equal to 5 percent of its dry weight, at levels up to 1.2 percent of the ration had no injurious effect on the growth of chicks. A ground cigar leaf tobacco with a nicotine content of 0.9 percent when fed at levels of 4.7 percent or more retarded the growth of chicks and increased the mortality. *Nicotiana rustica* at a 0.4 percent level was effective in controlling an artificial infestation of roundworms and practically as efficient in controlling a natural infestation, but was ineffective in controlling a natural infestation of cecal worms.

Mortality in progeny in relation to egg production of dams, M. A. Jull (*Poultry Sci., 13 (1934), No. 2, pp. 67–73*).—An analysis was made by the U.S.D.A. Bureau of Animal Industry of the mortality of the progeny of Rhode Island Red dams selected on the basis of their record of 200 or more eggs and of White Leghorn dams selected on their record of 225 or more eggs laid during their first laying year. There was no relationship between egg production of dams and the mortality of growing chicks during the first 4 weeks. A relatively greater number of laying pullets produced by the hens above the mean egg production of all birds in each pen died during their first laying year than did those produced by the hens below the mean egg production. In the case of White Leghorns the difference was significant.

The pullets of both breeds that died during the first laying year began laying later in life than pullets that survived. Pullets of both breeds that died after the first 50 days of laying produced significantly fewer eggs during that period than pullets that survived. The rate of laying did not influence the duration of life. On the other hand, the factor causing mortality tended to increase the age at which laying began, to reduce production, and to cause death within 1 yr. of the date of first egg.

Pullet mortality, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 169 (1934), pp. 137–142*).—Continuing the previous discussion (E.S.R., 71, p. 685), the results are reported of 4 years' tests with pullets grown in confinement, on contaminated range, and on fresh range. The results showed that young chicks develop a tolerance or resistance to certain contaminations if exposed at an early age. Such chicks, where carried along through the pullet laying year, showed a lower mortality than chicks that had been raised under more sanitary conditions. Pullets hatched from eggs laid by hens that

had survived from flocks which suffered a high rate of loss during their pullet year from paralysis and other causes of mortality had a total loss of 29 percent, 7 percent of which was due to paralysis, as compared with a mortality of 34 percent, 18 percent of which was due to paralysis, among pullets hatched from pullet eggs.

A few of the methods of preventing pullet losses are discussed, such as adequacy of ration, special management, and special breeding.

Characteristics of an abnormal type of egg shell, H. J. ALMQUIST and B. R. BURMESTER (*Poultry Sci., 13 (1934), No. 2, pp. 116–122, fig. 1*).—The California Experiment Station made a study of the characteristics of abnormal eggshells known as "glassy" shells. These shells have a large number of small spots that are more translucent than the rest of the shell. When tapped such shells emit a musical clink, while normal shells give only a dull sound.

Shells of the above type were lower than normal shells in respect to porosity, shrinkage of contents, thickness, percentage of shell membrane, and breaking strength. They had a higher percentage of shell protein and a slightly lower percentage of calcium carbonate than normal shells, but in other respects were quite similar. The percentage of protein did not influence the breaking strength of the shell and tended to decrease as the shell thickness increased. Because of the low porosity, glassy eggs retained their fresh quality at room temperatures better than normal eggs, but the whites tended to become cloudy and liquefy rapidly in cold storage.

The odor and flavor of eggs, R. B. MCCAMMON, M. S. PITTMAN, and L. A. WILHELM (*Poultry Sci., 13 (1934), No. 2, pp. 95–101*).—Studies at the Kansas Experiment Station indicated that the yolk color of eggs was affected by the ration fed, becoming deeper with the addition of yellow corn or green wheat. More variations were noted for odor than for flavor, and the former was always less desirable than the latter. The odor was apparently influenced by both the ration and method of handling. Strong odors due to method of handling disappeared on holding. Eggs held for 1 week at 70° F. were only slightly less desirable in odor and flavor than eggs less than 24 hr. old, but when held for 1 mo. at the above temperature all eggs showed evidence of deterioration. There was little variation in the flavor of eggs produced on a green-wheat ration, while eggs produced on other rations showed significant changes in this respect. There was a tendency for dark-colored eggs to have a more objectionable flavor than the lighter eggs, although the differences were too slight to be readily detected.

Ducks and geese, J. K. LIPSCOMB and H. HOWES (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 70 (1934), pp. V+38, pls. 6*).—Methods are presented for the successful breeding, feeding, management, and marketing of ducks and geese and their byproducts.

Rex-furred rabbits, W. K. WILSON (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 73 (1934), pp. V+13, pls. 5*).—This bulletin explains how by breeding and selection natural undyed rabbit furs in a wide range of coloring may be produced. Such pelts closely resemble those from the more expensive furbearing animals.

DAIRY FARMING—DAIRYING

A study of certain phases of the economics of dairy-cattle feeding, R. R. GRAVES and J. B. SHEPHERD (*U.S. Dept. Agr., Bur. Dairy Indus. [Roughage Feed. Ser. 1] [1934], pp. 26*).—The results are discussed of feeding experiments at the Huntley, Mont., Field Station (E.S.R., 61, p. 669) on the production of cows on three planes of feeding and of the cost of producing feed crops in

eight counties in three midwestern States. The data have been combined to show the relative profitableness of feeding dairy cows on roughage alone, on a limited grain ration, or on a full grain ration, when the cost of feed is based on the actual cost of producing it, and when the price of butterfat ranges from 20 to 70 ct. per pound.

A study of the effect of modified systems of farming and feeding on milk production and net returns over cash outgo for purchased feeds, R. R. GRAVES and J. B. SHEPHERD (*U.S. Dept. Agr., Bur. Dairy Indus., Roughage Feed. Ser. 3 (1934), pp. 16*).—In cooperation with the New Jersey Experiment Stations, a survey was made of farm practices and profits on 98 dairy farms in that State. These results have been reported (E.S.R., 67, p. 615). Using this information, the authors calculated the possibility of increasing net returns by modifying the cropping and feeding practices on such farms in order to reduce or eliminate the feeding of purchased concentrates.

Suggested methods for reducing milk production and curtailing sales under the AAA program (*U.S. Dept. Agr., Bur. Dairy Indus., 1934, pp. 30*).—In this mimeographed pamphlet suggestions are given relating to economical methods of reducing the quantity of milk and butterfat produced, through changes in herd management and feeding practices, and to ways of utilizing greater quantities of milk and butterfat on the farm.

Selecting dairy cattle, W. B. NEVENS and A. F. KUHLMAN (*Illinois Sta. Circ. 422 (1934), pp. 42, figs. 22*).—The important points to be considered in the selection of cows and heifers as present and future milk producers and as breeding animals and of bulls as heads of herds are discussed. The relative merits of the various parts of the animal as guides are pointed out. It is suggested that in order to acquire skill in selecting dairy animals a careful detailed study of many individuals is necessary.

Roughage rations for dairy cows make less milk and more profit (*U.S. Dept. Agr., Bur. Dairy Indus., [Roughage Feed. Ser. 2], [1934], pp. 12*).—The production of full grain, limited grain, or roughage-alone rations is shown, based on both published (E.S.R., 61, p. 670) and unpublished data. The results suggest that it is possible by the use of greater amounts of roughage to produce less milk on the farm and at the same time to obtain a greater profit.

Appended is a series of questions and answers pertinent to such a system of milk production.

A comparison of rotational and continuous grazing of pastures in western Washington, R. E. HODGSON, M. S. GRUNDER, J. C. KNOTT, and E. V. ELLINGTON (*Washington Sta. Bul. 294 (1934), pp. 36, figs. 11*).—A direct comparison of rotational with the ordinary methods of continuous grazing was made at the Western Washington Experiment Station over a 3-year period. The other principles ordinarily used in an intensive system of grassland management were employed for both pastures. The pastures used consisted of a mixture of grasses and legumes. A low-protein grain mixture was fed in limited amounts in both groups.

The average production was 41 lb. of milk for cows on continuous grazing and 44.8 lb. for those on rotational grazing. The average daily increase in butterfat production was 0.1 lb. in favor of the rotational group. The chemical analyses of pasture clippings showed that there was sufficient protein to meet the requirements of grazing animals.

The yield of total digestible nutrients of the pastures was determined by calculating the requirements for maintenance, milk production, and gain or loss in live weight and deducting the total digestible nutrients furnished in

the form of supplemental feed. By this method of calculation it was found that each acre of rotated pasture furnished 5,986.4 lb. and each acre of continuous pasture 5,498.6 lb. of total digestible nutrients. Continuous grazing furnished 84.3 percent of the total digestible nutrients required by the cows, while rotational grazing furnished 85.9 percent. The carrying capacity of pasture was increased 8.8 percent in favor of rotational grazing when measured on the basis of standard cow days per acre.

The average yearly yield of dry matter was 11,411.1 lb. for continuous pasture and 9,479.5 lb. for the rotated pasture. The average crude protein content was 21 and 18.8 percent for the respective pastures. The mineral content of the clippings was high, averaging 0.73 and 0.56 percent of calcium and phosphorus, respectively. The amount of clumping was not significantly different for the two types of grazing, but there was apparently a close relationship between the amount of clumping and the amount of grass available for grazing. Spreading the droppings with a fork appeared to reduce clumping to a minimum.

The results showed that highly productive pastures furnished sufficient nutrients for high milk production.

Methods of measuring pasture yields with dairy cattle, J. C. Knott, R. E. Hodgson, and E. V. Ellington (*Washington Sta. Bul. 295 (1934), pp. 20*).—Because of the lack of uniformity of method in measuring pasture yields with dairy cattle, the total digestible nutrient yield method is recommended. This method measures results under actual grazing conditions and takes into consideration the requirements for gain in live weight, maintenance, and milk production from which is deducted the nutrient content of supplemental feed consumed. The remainder represents the nutrients derived from pasture. Allowance may also be made for loss in live weight.

A standard of total digestible nutrient requirements per pound of gain in live weight with dairy cows of 3.53 lb. is recommended, and the method of arriving at this amount is explained. An allowance of 2.73 lb. of total digestible nutrients for each pound of loss in live weight is suggested. For converting pasture yields into carrying capacity or cow days, it is recommended that 16 lb. of total digestible nutrients be used for a standard cow day.

Using the above method it was found that the average yearly yield chiefly of total digestible nutrients for a pasture mixture under continuous grazing was 5,498.5 lb., for the same mixture under rotational grazing 5,985.7 lb., for a reed canary grass pasture 5,253.6 lb., and for a wheat pasture 1,875 lb. per acre. The standard cow days were 343.6, 374.1, 328.4, and 117 for the respective pastures.

Appended are tables giving the details of 3 years' study using the above methods.

Why fertilize pastures? C. B. Bender (*N.J. Agr. [New Jersey Stas.], 16 (1934), No. 3, p. 3*).—The April application of 300 lb. of nitrogen per acre to pasture land made grass available for grazing from 10 days to 2 weeks earlier than untreated grass, forage so treated was more palatable, and the sod was more dense than on untreated pastures. Best results were obtained when the nitrogen was applied to the better sods. One pasture carried 40 milking cows from May 1 to May 22 on 6 acres.

The feeding value of artificially dried pasture herbage for milk production, J. C. Knott and R. E. Hodgson (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 409–416*).—Following the previous studies (E.S.R., 68, p. 519) at the Washington Experiment Station, two feeding trials were conducted with lactating

dairy cows to determine the possibility of using artificially dried pasture herbage in place of part or all of the concentrate mixture. In one trial a concentrate mixture containing 20 percent of artificially dried grass was compared with a basal ration of similar composition, while in the second trial a ration of alfalfa hay and artificially dried grass was compared with alfalfa hay alone.

In the first trial there was no significant difference in the production and gain in live weight of the two lots. The lot receiving the artificially dried grass did consume less feed per unit of production. In the second trial the cows receiving dried grass and alfalfa hay consumed more total digestible nutrients, and this consumption was accompanied by a greater gain in weight and an increase in milk and butterfat production. The nutrients required per unit of production were about the same in both lots. It was concluded that artificially dried pasture grass may be efficiently used to replace at least a part of the concentrate ration for milking cows.

[Experiments with dairy cattle in Texas], O. C. Copeland (*Texas Sta. Rpt. 1933, pp. 106, 107*).—The work with dairy cattle led to results reported on cottonseed meal and hulls as a ration for lactating dairy cows and on ground wheat as a feed for dairy cows.

The utilization of Atlas and Kansas Orange sorgo seed by dairy cows, J. B. Fitch and F. B. Wolberg (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 343–350*).—In order to obtain information on the utilization of the grain in Atlas and Kansas Orange sorgo silage, the Kansas Experiment Station fed three dairy cows during 4-day preliminary periods and 5-day collection periods. In the first period the cows received Kansas Orange silage, alfalfa hay, and a grain mixture. During the second period Atlas silage was substituted for the Kansas Orange silage. During the third period the cows received Kansas Orange seed unground and alfalfa hay, and in the fourth period Atlas seed and alfalfa hay. In still another trial eight cows received Atlas silage as the sole feed.

Of the Kansas Orange and Atlas sorgo silage fed, approximately 43 and 36 percent, respectively, of the seeds were voided in the feces when the remainder of the ration consisted of alfalfa hay and a grain mixture. When fed alone 30 percent of the seeds of Atlas silage were voided. When fed with alfalfa hay 62 percent of the Kansas Orange and 51 percent of the Atlas seeds were lost in the feces. In these tests 19 percent more of the Kansas Orange and 15 percent more of the Atlas seeds were utilized by the animals when fed in the form of silage than when fed as whole grains. A negligible amount of the nutrients of the whole seeds recovered in the feces had been utilized by the animals. The ensiling process destroyed the germination of the seed, and this property was greatly reduced in whole seeds that passed through the digestive tract.

Further studies of the influence of different levels of fat intake upon milk secretion, II, L. A. Maynard, C. M. McCay, H. H. Williams, and L. L. Madsen (*[New York] Cornell Sta. Bul. 593 (1934), pp. 14*).—Continuing this study (E.S.R., 68, p. 663), no significant difference was observed in the milk and fat yields of cows receiving a 4 percent fat level in the grain mixture and those receiving fat levels ranging from 6.5 to 7 percent. There was no evidence that the level of fat intake had any influence on the fat percentage of the milk.

It was concluded that in practice a level of 4 percent of fat in a grain mixture which was fed at the rate of 1 lb. to every 3 to 3.5 lb. of milk produced, together with an adequate amount of hay and corn silage, was sufficient

to meet ordinary requirements of the animal. A higher level of fat was not justified if it increased the cost of the ration per unit of total digestible nutrients.

The fat percentage of milk as affected by feeding fats to dairy cows, N. N. Allen (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 379–395, figs. 4*).—In this paper from the Minnesota Experiment Station the results are reported of six experiments dealing with the effect of increasing the fat content of the ration on the fat content of the milk.

A marked increase in the fat content of milk resulted when the fat content of the ration was increased during 6-day periods by the addition of butterfat, lard, tallow, or linseed, cottonseed, corn, peanut, soybean, or coconut oil. The degree of influence was largely proportional to the amount of fat fed. The increase was obtained regardless of the breed of the cow, the stage of lactation, the level of production, or the season of the year. The increase was largely due to an increased butterfat production, since the milk flow, except in the case of coconut oil which had a depressing effect when fed in large amounts, was only slightly influenced. The increase in the butterfat of the milk represented only from 10 to 20 percent of the increased fat intake. It required from 12 to 14 hr. after fat was fed before its influence was observable, and the effect was noted for from 30 to 42 hr. after feeding was stopped. The lag appeared to correspond to the time needed for the digestive, circulatory, and secretory processes to take place. The effect of the fat was exerted whether the fat was added to an adequate ration or whether it replaced an equal amount of energy in the form of carbohydrates. It was not necessary to feed fat in an emulsified form since it was effective when fed after melting and mixing with the grain.

A statistical study of the relationships between the constituents of milk, A. Black and L. Voris (*Jour. Agr. Res. [U.S.], 48 (1934), No. 11, pp. 1025–1032, fig. 1*).—Based on the analyses of 134 samples of Holstein milk representing an entire lactation period for 12 cows, the Pennsylvania Institute of Animal Nutrition reports the results of a statistical analysis of the relation of the various constituents.

It was found that as the fat percentage increased the energy and the percentages of total solids, protein, solids-not-fat, calcium, and magnesium increased. When the energy value increased, the percentages of total solids, solids-not-fat, protein, calcium, magnesium, and phosphorus increased. As the protein percentage increased, the total solids, solids-not-fat, calcium, and ash percentages increased and the potassium percentage decreased. When the percentage of total solids increased, the solids-not-fat, calcium, magnesium, and phosphorus percentages increased. As the solids-not-fat increased, the percentages of calcium, magnesium, phosphorus, and lactose increased. When the lactose percentage increased, the percentages of sodium and chlorine decreased. As the percentage of ash increased the percentage of calcium increased, and as the chlorine percentage increased the sodium percentage increased.

Real cooling saves milk money, F. C. Button (*N.J. Agr. [New Jersey Stas.], 16 (1934), No. 3, pp. 3, 4*).—In this article the author describes the multiplication of bacteria in milk under favorable temperature conditions. The necessity of properly cooling milk and of producing clean milk during hot weather is pointed out.

Rapid heating and cooling in vat pasteurization to preserve creaming properties, J. C. Marquardt and A. C. Dahlberg (*Milk Plant Mo., 23 (1934), No. 5, pp. 28–30, 32, 34, 37, 38, figs. 2*).—Investigations at the New York State

Experiment Station showed that the rate of heating and cooling milk in a pasteurizing vat could be increased sufficiently to permit vat pasteurization and cooling of milk with little or no impairment of its creaming ability. Cooling should be rapid enough to reduce the temperature of the milk from 143° to 40° F. in 20 min. or less. Any reduction in cream layer volume was most pronounced after 2- and 4-hr. creaming periods.

More rapid agitation of the milk and the use of hotter water and colder brines made possible the increased rate of heating and cooling. It was possible to greatly increase the degree of agitation for a given equipment and quantity of milk without affecting creaming when the time was reduced, but cases of reduced cream layer volume caused by too severe agitation were encountered. The pasteurized milk did not respond consistently in its creaming properties when held cold before bottling.

Studies of the technic to evaluate the efficiency of several chlorine sterilizers for dairy use, E. D. Devereux and W. L. Mallmann (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 351–360*).—The Michigan Experiment Station found that sterile sample bottles containing sodium thiosulfate were more satisfactory than the bottles ordinarily used for obtaining samples of chlorinated dairy solutions intended for bacteriological analysis. The iodometric and orthotolidine tests did not necessarily measure the germicidal powers of used chlorine solutions.

The hypochlorite sterilizers obtained in actual practice in sodium thiosulfate treated sample bottles were effective against the organisms in dairy equipment. The solutions in all the concentrations had a marked germicidal action against *Escherichia coli.* The chloramine-T compounds used had a delayed germicidal action. Hypochlorite rinse solutions with 6 p.p.m. residual chlorine contents were effective for disinfecting dairy equipment. The use of large volumes of rinse was of more importance than high chlorine residues, especially with chloramine-T compounds.

The use of chlorin products as germicides on dairy farms, W. G. Loveless (*Vermont Sta. Bul. 369 (1934), pp. 72, figs. 5*).—In this investigation, based on published literature, laboratory tests, and practical experiments, it was found that concentrated compounds containing "available chlorine" deteriorated during storage. If held in the dark the rate of deterioration was slowed up. When foreign organic matter came in contact with a germicidal chlorine solution the concentration of available chlorine was lowered. The rate of loss of available chlorine increased as the temperature of the solution increased from 70° to 212° F.

Laboratory tests showed that chloramine-T solutions were slower acting than hypochlorites. Acidification and increasing the temperature of chloramine-T solutions increased the germicidal activity, but not to the extent exerted by hypochlorites. In selecting a type of compound to use and in setting up a procedure for sterilization the factor of metal corrosion should be given consideration. Off flavors due to traces of chlorine left in utensils after treatment were negligible when the solution was carefully used and the utensils thoroughly drained.

The bacteriological quality of milk produced in farm utensils treated with chlorine solutions was shown by laboratory and practical tests to be definitely improved when compared with milk produced in utensils not treated in this manner. The convenience and low cost of hypochlorite treatment as compared with steam are advantages in favor of this germicide.

Significance of colon organisms in raw milk, H. C. Moore and J. M. Fuller (*New Hampshire Sta. Tech. Bul. 57 (1934), pp. 6, figs. 2*).—Milk samples were selected for this study from 108 producers furnishing milk to plants in

three different parts of the State. The samples were taken at the plant and plated the same day. The plates were studied for total bacterial count and for colon count. The farms producing the samples were visited, and the stables, milk rooms, and dairy equipment scored.

The results showed that the colon count was of little value in judging conditions under which the milk was produced. The study emphasized the fact that the skill of the producer of the milk was of more importance than his facilities for producing clean milk.

Butter as a substrate for mold growth, H. Macy and G. H. Steele (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 397–407*).—The Minnesota Experiment Station undertook in this study to determine the ability of molds, collected from butter and from the equipment or materials used in its manufacture and packaging, to develop on butter. Small blocks of sterile unsalted butter were inoculated with 372 cultures, representing 19 known genera, 70 identified species, and 30 unidentified species, and stored at various temperatures, to observe the extent of growth of the fungi.

Under favorable conditions the butter used definitely supported the growth of more than 96 percent of the cultures. Two weeks' storage at 5° C. checked the growth of some of the molds, while no molds occurred during storage at —18° for 20 weeks.

Many of the cultures spoiled the appearance of the butter, but the most serious damage was done by species of *Alternaria, Hormodendrum, Phoma,* and *Stemphylium.* The aroma of the butter was almost always affected by the mold growth. On the basis of these results it was shown that unsalted butter should be kept at low temperatures to prevent the growth of molds.

Methods and problems of farm butter making, G. M. Trout (*Michigan Sta. Circ. 151 (1934), pp. 20, figs. 8*).—Directions for making high-quality farm butter are presented.

Pimientos in processed cheese, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 361–364, fig. 1*).—The Wisconsin Eperiment Station undertook a study of the use of pimientos in processed cheese in an effort to determine why certain varieties or sources of supply received preference to the practical exclusion of other available types. One brand of pimientos from Georgia, one from California, and two from Spain were tested. After mixing with blended cheeses the judges were asked to indicate their preference in regard to the color of the cheese mass and the pimientos, the distribution and size of the pimiento pieces, and the flavor.

There was a decided eye appeal in processed cheese containing pieces of bright red pimientos and the pieces of a size that could be readily seen. It was found that the use of fire-roasted peppers eliminated possible off flavors due to oil roasting, either because of the use of old or rancid oil or the incomplete removal of oil after roasting.

Cheese spreads, II, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 373–378*).—Continuing this investigation (E.S.R., 68, p. 242) at the Wisconsin Experiment Station, a study was made of the effect of added milk solids in the form of either skim milk or whey powder, a comparison of the emulsifiers commonly used, and the effect of the age of the cheese on the texture and body of the spread.

Whey powder tended to produce a weaker body than skim milk powder, but also gave a rather distinctive sweet taste that might be agreeable to some users. Skim milk powder in the proper proportions gave a very satisfactory product. A cheese made with this product could be spread easily, or, if necessary, could be satisfactorily sliced.

Sodium citrate, except when used with very old cheese, prevented fat leakage and produced a body that was more uniform than that resulting from the use of either Rochelle salt or disodium phosphate. With the latter emulsifier there was a greater tendency to fat leakage than with the other salts. It was found advisable to use some very old cheese in blending to give a product with a satisfactory flavor. Old cheese alone was apt to give a grainy product that showed fat leakage, while young cheese alone gave a product that was too rubbery to spread well. No composition formula could be devised to meet universal approval.

The influence of citric acid upon titratable acidity and hydrogen-ion concentration of frozen desserts, A. C. Dahlberg and J. C. Hening (*Jour. Dairy Sci., 17 (1934), No. 5, pp. 365–372, figs. 4*).—The New York State Experiment Station planned this investigation to establish the relationship between titratable acidity and pH with the idea that a more satisfactory basis could be found for differentiating sherbets from ice milk or ice cream in the pH values.

The original moisture content of monohydrated citric acid crystals, granules, or powder decreased more or less rapidly from 8.5 to 0.1 percent under atmospheric conditions. Since this latter value was the moisture content of dehydrated citric acid, it was felt that more consistently uniform results could be obtained by using the acid in dry form. Citric acid added to water ices could be accurately accounted for by direct titration, but in the case of sherbets and ice cream the results were consistent only when allowance was made for the alkali needed to neutralize the dairy products. The pH of frozen desserts was affected by added citric acid to the extent of the buffer action of the milk solids. The pH of sherbets and ices was below 5 because they were acid fruit products with little or no milk solids, while the pH of ice cream and ice milk was above 6. It was felt that a pH of 5 could be used as a reasonable differentiating point to distinguish between sherbets and ices and sweet frozen desserts.

A handbook of dairy statistics, T. R. Pirtle (*U.S. Dept. Agr., 1933, pp. IV+129*).—This handbook supplements one previously noted (E.S.R., 59, p. 577) and brings the data up to date.

VETERINARY MEDICINE

[Work in animal pathology at the Georgia Station] (*Georgia Sta. Rpt. 1933–34, pp. 20, 21, 25*).—The work with infectious abortion in dairy cattle and internal parasites of farm animals, the latter in cooperation with H. P. Raffensberger of the U.S. Department of Agriculture, is briefly referred to.

[Contributions on animal pathology] (*N.Y. State Vet. Col. Rpt., 1932–33, pp. 58–209, figs. 7*).—The contributions here presented include the following: Studies on Fowl Pox Vaccination (pp. 58–68) and Some Observations on Pox Virus Obtained from a Turkey (pp. 69, 70), both by E. L. Brunett; Erythrocyte, Leucocyte, and Hemoglobin Determinations on the Blood of Cattle, with a Note on the Blood in Johne's Disease, by W. T. Miller (pp. 71–80); *Trichomonas* Infection in Cattle—A Preliminary Report, by H. S. Cameron, M. G. Fincher, and H. L. Gilman (pp. 81–86); Vibrionic Abortion of Sheep, by H. L. Gilman (pp. 87, 88); Uses of Some Drugs Acting upon the Circulatory System, by H. J. Milks (pp. 89–95); Observations on the Significance of Leucocytes in Milk, by S. D. Johnson and F. G. Trudel (pp. 96–110); The Relation between the Presence of Fibrotic Tissue in the Udder and Streptococci or Cells in Freshly Drawn Milk, by G. J. Hucker and D. H. Udall (pp. 111–119); Studies on the Control of Johne's Disease (pp. 120–133) and Six Years' Experience with a Herd Experimentally Infected with Johne's Disease (pp. 134–149), both

by W. A. Hagan and A. Zeissig; The Passage of Bovine *Brucella* through Swine, by H. L. Gilman, C. H. Milks, and R. R. Birch (pp. 150–154); Types of *Brucella* Recovered from Milk in New York State, by H. L. Gilman and C. H. Milks (pp. 155, 156); A Bang's Disease Survey of a Representative Dairy Township, by R. R. Birch (pp. 157–164); The Handling of Bang's Disease in the Field, by R. R. Birch, C. H. Milks, and H. L. Gilman (pp. 165–201); and Facts You Should Know about Bang Abortion Disease, by R. R. Birch (pp. 202–209).

[Report of work in animal pathology and parasitology in Texas] (*Texas Sta. Rpt. 1933, pp. 10–17, 19, 206–211*).—The work of the year referred to (E.S.R., 70, p. 241) includes that with loin disease of cattle, infectious bovine abortion, sore mouth in lambs and kids, stomach worms in sheep and goats, anaplasmosis, hard yellow livers in sheep and cattle, sheep losses in the feed lot, convulsions in sheep, and a new disease in cattle, all by H. Schmidt; loco weed poisoning, in cooperation with the U.S.D.A. Bureau of Animal Industry, and miscellaneous poisonous plants (*Nolina texana, Agave lechuguilla, N. erumpens, Psilostrophe gnaphalodes, P. tagetinae, Gutierrezia sarothrae, G. lucida, Crypthantha palmeri, Lepidium alyssoides, Senecio longilobus*, and *S. riddellii*), both by F. P. Mathews; and loco poison, by G. S. Fraps and E. C. Carlyle. Work at the Sonora Substation, also reported upon, relates to the toxicity of bitterweed (*Actinea odorata*), contagious ecthyma (sore mouth) of sheep and goats, swellhead of sheep and goats, and miscellaneous suspected poisonous plants (*Lapachys tagetes, P. gnaphalodes, S. longilobus, Haploesthes gregii, Corydalis aurea occidentalis*, and *G. lucida*), all by L. B. Boughton and W. T. Hardy.

[Work in animal pathology in Great Britain] ([*Gt. Brit.*] *Min. Agr. and Fisheries, Rpts. Agr. Res. Insts.* [*etc.*], *1929–30, pp. 119–133; 1930–31, pp. 141–159; 1931–32, pp. 159–176*).—These reports (E.S.R., 65, p. 566) relating to research work in (1) the Research Institute in Animal Pathology, Royal Veterinary College, London; (2) Institute of Animal Pathology, Cambridge University; (3) Veterinary Laboratory, Ministry of Agriculture and Fisheries; (4) Animal Diseases Research Association of Scotland; and (5) Animal Diseases Division, Ministry of Agriculture for Northern Ireland, include that with mastitis in bovines, Johne's disease, infectious abortion, filtrable viruses, contagious postular dermatitis, caseous lymphadenitis, foot-and-mouth disease, bovine tuberculosis, fowl pox, pullorum disease, etc.

[Contributions in animal pathology in the Union of South Africa] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 2 (1934), No. 2, pp. 375–562, 667–689, figs. 47*).—The contributions here presented (E.S.R., 71, p. 527) include the following: The Immunization of Horses and Mules against Horsesickness by Means of the Neurotropic Virus of Mice and Guinea-Pigs, by R. A. Alexander and P. J. du Toit (pp. 375–391) (see p. 850); The Occurrence and Identification of Bluetongue in Cattle—the So-called Pseudo-Foot and Mouth Disease in South Africa, by J. G. Bekker, G. van de W. de Kock, and J. B. Quinlan (pp. 393–507); Investigations into the Transmission of Bluetongue in Sheep during the Season 1931–1932, by O. Nieschulz, G. A. H. Bedford, and R. M. du Toit (pp. 509–562); Chase Valley Disease (*Cestrum laevigatum* Schlecht), Its Toxic Effects on Ruminants, by J. A. Thorburn (pp. 667–679); and *Urginea capitata* Baker—The Berg Slangkop, Its Toxic Effect on Ruminants, by D. T. Mitchell, A. S. Canham, and A. M. Bayer (pp. 681–689).

Some symptoms and lesions produced by stock-poisoning plants, A. B. Clawson (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 179–192*).—In this contribution the author considers the peculiarities of poisonous plants, cumulative effects of ragwort (*Senecio*), greasewood (*Sarcobatus vermiculatus*)

poisoning, cocklebur (*Xathium* sp.) poisoning, milkweed (*Asclepias eriocarpa*) as poisonous for sheep, nausea produced by certain plants, sneezeweed (*Helenium hoopesii*) as producing nausea, Colorado and Texas rubberweed, constipation and diarrhea, plants which produce spasms, and cirrhosis of the liver.

Experimental studies of postmortem bacterial invasion in animals, C. G. BURN (*Jour. Infect. Diseases, 54 (1934), No. 3, pp. 388–394*).—The author found *Clostridium welchii*, *Escherichia coli*, and staphylococci to be capable of invading the tissues of animals within from 5 to 48 hr. after death when the bodies were kept at 25° C. "A large group of pathogenic and nonpathogenic bacteria failed to invade the tissues after death, even though ample opportunity was given for invasion to occur. The quantity of organisms, their location within the body, and the time between death and autopsy are undoubtedly important factors influencing post-mortem invasion. A temperature of 10° inhibits the growth of [*E.*] *coli* and [*C.*] *welchii* even after 96 hours' incubation. Increased temperature failed to bring about spread of strains of bacteria known to be noninvasive."

The "carrier" problem in controlling infectious diseases of animals, W. L. HINDMARSH (*Agr. Gaz. N.S. Wales, 45 (1934), No. 4, pp. 188–190*).—A practical discussion is given of the importance of the carrier in the control of infectious diseases of livestock.

An epizootic disease occurring in a breeding stock of mice: Bacteriological and experimental observations, T. J. MACKIE, C. E. VAN ROOYEN, and E. GILROY (*Brit. Jour. Expt. Path., 14 (1933), No. 3, pp. 132–136*).—The authors report upon a fatal disease of mice that made its appearance in February 1932 in a mouse colony that was being used for genetic experiments. The causative organism isolated and here described has been found difficult to classify, having been clearly differentiated from *B*[*acillus*] *murisepticus*. The etiological relationship of this organism to the disease has been fully established, having been isolated in culture with constancy from a large number of naturally infected animals, and cultures on experimental inoculation having reproduced the same pathological condition. From the animals so infected the organism has been recovered and again proved virulent on passage.

Dehydrogenases of the filtrable organism of Agalactia, A. PIRIE (*Biochem. Jour., 28 (1934), No. 2, pp. 411–415*).—In a survey of the dehydrogenases and oxidizing enzymes of Agalactia it was found that "the most active dehydrogenases are those attacking lactate, adenylic acid, adenosine, fructose, and hexosediphosphate. Other dehydrogenases need very high substrate concentrations. The relative strengths of the dehydrogenases vary from culture to culture. This variability does not seem to depend entirely on the medium or on the phase of growth at which the enzymes are estimated. The lactate enzyme is similar to the lactic dehydrogenase of *Esch*[*erichia*] *coli* in that it is strongly inhibited by gluconate and oxalate."

A minimal computation of the amount of blood removed daily by Haemonchus contortus, C. J. MARTIN and I. CLUNIES ROSS (*Jour. Helminthol., 12 (1934), No. 3, pp. 137–142*).—It is estimated that the minimum blood intake required to furnish sufficient phosphorus for the egg production of 2,000 female stomach worms would be 29 cc per day. It is pointed out that while the males also sucked blood, though probably less than the females, there is no means of arriving at their requirements.

Metamorphosis of Metastrongylus larvae and mesenteric lymph glands, M. HOBMAIER (*Arch. Path., 17 (1934), No. 6, pp. 769–774, figs. 3*).—The study here reported is said to corroborate the earlier statement that "the infestive larvae of *Metastrongylus* must invade the mesenteric lymphatic glands of the

vertebrate host to grow there into sexual larvae and that they do not enter the tributaries of the portal vein as a part of their regular life cycle.

"The pathologic changes observed in the invaded lymph glands may be explained as the result of the trauma inflicted by the embolization of the larvae into the lymphatics, by the dilatation and occlusion of these vessels during the development of sexual larvae, and by the disarrangement of anatomic structures caused by their emigration."

Observations on active immunisation against anthrax, F. H. MANLEY (*Vet. Jour., 90 (1934), No. 6, pp. 245–262*).—The author has found it possible in a small-staffed laboratory to prepare a spore vaccine from attenuated strains by the so-called South African method, here described, sufficient to inoculate approximately 400,000 animals per year. The safety and efficiency of the sheep vaccine was demonstrated in the laboratory experiments and proved in the field. It is pointed out that the immunity produced by the goat vaccine and demonstrated by resistance to test inoculations is not quite so satisfactory, and that the very strong susceptibility shown by some goats must be an important consideration.

The susceptibility of the mouse to the virus of Aujeszky's disease [trans. title], J. JANSEN (*Tijdschr. Diergeneesk., 61 (1934), No. 14, pp. 761–763; Ger., Eng., Fr. abs., p. 763*).—The mouse was found to be susceptible to the virus of Aujeszky's disease when intracerebrally injected, 17 passages having been carried out with a mortality of 100 percent. The virus cannot be transferred by subcutaneous inoculation.

Filtration of the virus of Borna disease through graded collodion membranes, W. J. ELFORD and I. A. GALLOWAY (*Brit. Jour. Expt. Path., 14 (1933), No. 3, pp. 196–206, pl. 1*).—The authors describe a technic devised for the regular production of bacteria-free and highly active filtrates of the virus of Borna disease from emulsions in broth of infective rabbit brain.

The size of the smallest phase of the virus of Borna disease has been estimated, from the results of experiments on its filtrability through graded collodion membranes, to be from 0.085μ to 0.125μ. The optimum H-ion concentration for maximum stability of the virus in broth medium at room temperature, from 15° to 20° C., corresponds to pH 7.4 to 7.6. The virus is very sensitive to changes of pH outside this zone, particularly on the alkaline side.

In an appendix (pp. 205, 206) it is pointed out by J. E. Barnard that the filtration results suggest that the virus of this disease is particulate, and that the size of the organism is comparable to that of infectious ectromelia or vaccinia.

Classification of Brucella, A. THOMSEN (*Jour. Infect. Diseases, 54 (1934), No. 3, pp. 345, 346, fig. 1*).—The author describes a type of growth of *B. suis* in bottles of beef broth observed in Denmark which appears to be highly characteristic of porcine *Brucella* strains. It proved constant in the 25 Danish strains examined, and 2 American porcine strains behaved in essentially the same manner. For comparison 25 bovine strains examined by the same technic grew profusely in the medium but less vigorously than the porcine strains, and they formed only a slight sediment which was easily resuspended by shaking. Five bovine strains in a carbon dioxide atmosphere grew approximately like the porcine cultures, with an abundant surface growth. Six melitensis strains yielded a vigorous diffuse growth with a moderate sediment, presenting degrees between the porcine and the bovine types.

A survey for the presence of Brucella agglutinins in pigs' blood in Great Britain, T. M. DOYLE (*Jour. Compar. Path. and Ther., 47 (1934), No. 2,

pp. 134–140).—A report is made of the agglutination tests of samples of blood from 10,474 sows for the presence of *Brucella* agglutinins. "Four bloods gave positive reactions in dilutions of 1:25, 17 bloods positive reactions in dilutions of 1:50, and 4 bloods positive reactions in dilutions of 1:100. Positive reactions in dilutions of 1:100 are generally regarded as indicating existing or recent infection with *B. suis*."

Intracutaneous reactions induced in guinea pigs inoculated with B. abortus, H. G. Dacey and N. Korovin (*Jour. Lab. and Clin. Med., 19 (1934), No. 6, pp. 589–592*).—In the study conducted precipitating properties were demonstrated with *B[acillus] abortus* antiserum. Complement was fixed in the presence of immune serum. Intracutaneous inoculation of one of these preparations induced macular reactions, with no evidence of necrosis or sloughing in four guinea pigs infected with microorganisms of the *abortus-melitensis* group. The results suggest that a carbohydrate substance extracted from microorganisms of the *abortus-melitensis* group may give reactions of a much milder character than those obtained with the whole micro-organisms, or with a protein extract.

A list is given of 27 references to the literature.

Intracerebral injections of foot-and-mouth disease virus in the guinea pig [trans. title], J. Jansen (*Tijdschr. Diergeneesk., 61 (1934), No. 11, pp. 567–569; Eng., Fr., and Ger. abs., p. 569*).—The author has found that guinea pigs infected by intracerebral injection of foot-and-mouth disease virus, type A, soon develop a generalized foot-and-mouth disease. The virus, however, is not demonstrable in the brain 24 hr. after injection of the virus. Guinea pigs inoculated with brain substance did not contract the disease, nor did they acquire any immunity.

Observations on the relationship of the virus of human influenza and dog distemper.—Preliminary report, A. Eichhorn and N. J. Pyle (*Jour. Amer. Med. Assoc., 102 (1934), No. 25, pp. 2082, 2083*).—The authors report upon experiments conducted which show that the virus of influenza in man apparently induces an immunity in ferrets against the distemper virus of dogs. It is pointed out that the available experimental data, as indicated in this preliminary report, suggest a possible relationship of influenza in man and distemper in dogs. Experiments to determine the possibility of cross-immunization are said to be in progress.

Formalin solution as a relief for lameness due to structural changes in the hoof caused by chronic laminitis, R. A. Acevedo (*Philippine Jour. Anim. Indus., 1 (1934), No. 2, pp. 111, 112*).—The author concludes that the cornifying and the anesthetic effects of repeated applications of a 10 percent formalin solution are the factors responsible for the relief obtained from its use in chronic laminitis.

A new treatment of osteomyelitis.—Preliminary report, M. A. Stewart (*Surg., Gynecol. and Obstet., 58 (1934), No. 2, pp. 155–165*).—In the course of observations made with a view to discovering a chemical substitute for the sterile living maggots in the treatment of osteomyelitis, it was discovered that "the maggots (*Lucilia sericata* Meig.) exude calcium carbonate through their body walls. It was found by means of the Roe and Kahn colorimetric method of calcium determination that 100 maggots will excrete an average of 0.6 mg of this substance each 24 hr. It was previously known that the larvae of a great number of flies contain within their bodies a large quantity of stored calcium carbonate, but it is recorded nowhere that this is eliminated in any way other than with the puparium. This discovery was significant because here is calcium carbonate being eliminated constantly, even if in small quanti-

ties, into the wound, and because, as Beckhold (1929) has pointed out, calcium ions stimulate phagocytosis."

This led to the development of the picric acid-calcium carbonate treatment here described and recommended by the author.

The therapeutic behavior of Lucilia sericata Meig. larvae in osteomyelitis wounds, M. A. Stewart (*Science, 79 (1934), No. 2055, pp. 459, 460*).—The author reports finding that the characteristic healthy granulation of wounds treated with blowfly larvae is apparently due to the alkalization of the wounds as noted above. The action of the excreted tryptase referred to by Hobson (E.S.R., 69, p. 559), which arises in the mid-gut, is dependent upon an alkaline reaction that is imparted to the wound by ammonia in the feces and by calcium carbonate, which is continually exuded in small quantities through the body wall. The removal of the necrotic tissue and the alkalization of the wound result in a reduction of the swelling of the soft tissue, with consequent increased drainage and decreased bone destruction, in protection to the tissue cells from autolysis stimulated by an acid condition and in retardation of bacterial growth. The calcium ions liberated from the exuded calcium carbonate stimulate phagocytosis. Bacteriological tests of the mid- and hind-guts of maggots previously fed upon *Staphylococcus aureus*, the most common etiologic agent of osteomyelitis, have been consistently negative, but histological examinations of similar guts have shown undissoluted bacteria to be as numerous in the rectum as in the proventriculus. It is pointed out that Hobson found the middle segment of the mid-gut of *L. sericata* larvae to have a pH value of from 3.0 to 3.5. "Exposure at 30° C., the apparent minimum temperature of an osteomyelitis wound, of growths of *S. aureus* to McIlvaine's buffer solutions ranging through pH values of 3.0, 3.2, and 3.5 demonstrated that marked mortality occurs at the highest pH, and at a pH of 3.2 complete killing was effected well within the time limit during which the food is retained in the acid region of the mid-gut. Thus are many of the pathogenic organisms removed from the wound; however, not enough of them are ingested to make this the chief factor in securing propitious results. It is believed that a considerable portion of the destructive leucocidin liberated by the bacteria is ingested by the maggots and probably rendered inert in the acid region of the intestines by means of the direct action of the acid or by virtue of its possession of an isoelectric point close to or at the point of concentration of the acid."

The author reports having succeeded in readily developing "extensive myiases in guinea pigs and in one human with *L. sericata* larvae. It was demonstrated that these maggots will readily attack normal, healthy tissue if necrotic tissue is not present, and even if it is present but not immediately accessible. It was further demonstrated, however, that these organisms do prefer necrotic tissue, provided it is exposed to their action at the time of implantation into the wound. From these findings it becomes apparent that blowfly larvae are potentially dangerous in human wounds and must, therefore, be employed with care and skill." He has demonstrated that experimental myiases in guinea pigs in which no necrotic tissue is present can be obtained with two different American strains of blowfly larvae.

The author found 7 sterile *L. sericata* larvae that were caged upon perfectly intact, healthy epidermis of his forearm to penetrate the skin and subcutaneous tissue to a depth of 3 mm in less than 48 hr.

Surgical maggots in the treatment of infected wounds.—Recent apparatus and methods in maggot production and research, W. Robinson and S. W. Simmons (*Jour. Lab. and Clin. Med., 19 (1934), No. 4, pp. 339–343, figs. 2*).—This further discussion of the subject (E.S.R., 69 p. 83; 70, pp. 213, 509)

deals with some recent devices and methods which have been found useful in maggot culture and research.

Destruction of pyogenic bacteria in the alimentary tract of surgical maggots implanted in infected wounds, W. Robinson and V. H. Norwood (*Jour. Lab. and Clin. Med., 19 (1934), No. 6, pp. 581–586*).—The authors report upon a study, made by means of dissections and bacteriologic cultures, of the relative abundance and viability of bacteria in the various sections of the alimentary tract of surgical maggots used to hasten the healing of infected wounds. The work has shown that large numbers of bacteria taken in with the food are destroyed in passing through the long, tubular stomach of the maggot. Complete destruction of any remaining organisms occurred in the intestine, since no viable bacteria were found in any of the cultures. A description is given of the method used in making the aseptic dissections.

A list is given of 19 references to the literature.

Effects of low temperature retardation in the culture of sterile maggots for surgical use, W. Robinson and S. W. Simmons (*Jour. Lab. and Clin. Med., 19 (1934), No. 7, pp. 683–689*).—The authors find that the eggs of *Lucilia sericata*, the dipteran commonly reared for maggot treatment, may be kept in a closed container in a refrigerator at 40° to 43° F. overnight and up to 28 hr. with a mortality only slightly greater than normal, but continued storage is very unfavorable and in 3 days results in almost complete destruction.

"Surgical maggots cannot satisfactorily be kept in cold storage. After 24 hours' retardation only 40 percent were able to resume feeding, and in 6 days almost 100 percent destruction occurred. A retarding food is described which eliminates the need of cold storage during the sterility tests. Prepupae are best adapted to cold storage, but even in this stage the possibilities are considerably limited. They lose weight and become shrunken during cold storage." It was found that when prepupae were stored from 3 to 4 weeks "the females which emerged were permanently injured and their egg-laying capacity was much reduced. Pupae are unable to withstand even a moderate period of retardation. After the second week mortality rose to about 66 percent, and most of the eggs subsequently laid failed to hatch."

The immunizing power of paratyphosus bacterin [trans. title], A. Hedström (*Skand. Vet. Tidskr., 24 (1934), No. 4, pp. 227–244, figs. 24; Eng. abs., pp. 243, 244*).—It was found in work with the mouse that a paratyphosus bacterin, consisting of 0.1 volume-percent of paratyphosus bacteria which had been killed by boiling and emulsified in a carbolized salt solution, possesses an evident immunizing effect on mice when subcutaneously injected in doses of 0.2 cc.

The presence and significance of agglutinins for some members of the Salmonella group occurring in the sera of normal animals, R. Lovell (*Jour. Compar. Path. and Ther., 47 (1934), No. 2, pp. 107–124*).—In continuation of an earlier study (E.S.R., 67, p. 599), a report is made of tests of the sera of a large number of normal healthy animals, including 263 pigs, 163 cattle, 71 sheep, 40 horses, and 40 rabbits, for agglutinins for *Bacterium aertrycke* (type, group, and "O" suspensions), *B. newport* (type and O suspensions), *B. paratyphosum* C (type and O suspensions), and *B. enteritidis* ("H" and O suspensions).

The majority of the samples of serum from pigs, cattle, sheep, and horses agglutinated various suspensions, but the majority of the samples of rabbit sera failed to agglutinate any of the suspensions tested. As judged by absorption tests, these normal agglutinins are specific. This specificity is not confined to whole bacteria, but is also apparent for the antigenic com-

ponents of the bacteria and supports the conclusion that agglutinins for both H and O antigens are present in normal sera. Samples of various tissues and intestinal contents of 144 pigs and 71 sheep were examined for *Salmonella* bacteria, and in no case was a member of the group isolated.

Characters of haemolytic streptococci isolated from pathological conditions in fowls, P. R. EDWARDS (*Jour. Compar. Path. and Ther., 47 (1934), No. 2, pp. 152–157*).—Contributing from the Kentucky Experiment Station in continuation of work with the streptococci previously noted (E.S.R., 70, p. 243), the author reports having found hemolytic streptococci isolated from cases of slipped tendon and from apoplectiform septicemia of chickens to be typical animal streptococci. Hemolytic streptococci said to have been isolated from infectious bronchitis of baby chicks were found to possess the characters of streptococci of human origin.

Occurrence of amyloidosis in rabbits experimentally infected with tuberculosis, R. M. THOMAS (*Amer. Jour. Path., 10 (1934), No. 3, pp. 419–423, fig. 1*).—In 175 rabbits that had been infected with bovine tubercle bacilli and allowed to die from their infection, amyloid degeneration had occurred in 52 percent. "The occurrence of amyloidosis was restricted to animals surviving longer than 2 mo. after infection. The frequency of occurrence was greatest after the eighth month (75 percent). The organs affected were the spleen, liver, and kidney, the spleen being most frequently affected. There was a uniform tendency for the deposition of amyloid to occur in those animals that showed the most extensive caseation of their lesions."

Endemic typhus fever, R. E. DYER (*Pub. Health Rpts. [U.S.], 49 (1934), No. 25, pp. 723, 724*).—The author found woodchucks, house mice, meadow mice, and white-footed mice to be susceptible to endemic typhus fever.

Sources of infection in undulant fever, J. SMITH (*Jour. Hyg. [London], 34 (1934), No. 2, pp. 242–249*).—Contributing from Aberdeen, Scotland, the author reports that 17 of the samples of milk from 183 cows yielded *Brucella abortus*. "Two hundred and two samples of butter, margarine, cheese, and ice cream failed to yield *B. abortus*, although samples of locally prepared butter and cheese both contained tubercle bacilli. Examination of the serum from slaughtermen and men working in allied trades showed some evidence of latent infection, but no indication of much real illness due to *B. abortus*. Examination of the sera of sheep failed to show any evidence that these animals become infected with *B. abortus*. The examination of sera and organs from pigs failed to show any evidence that the porcine type of *B. abortus* occurs."

Pathology of undulant fever, W. B. SHARP (*Arch. Path., 18 (1934), No. 1, pp. 72–108*).—This contribution is presented in connection with a five-page list of references to the literature.

Cattle diseases occurring in Palestine and segregation and prevention control of bovine contagious abortion, J. M. SMITH and S. J. GILBERT (*Jour. Compar. Path. and Ther., 47 (1934), No. 2, pp. 94–106*).—Following a brief introduction and notes on 10 common infectious diseases of cattle which occurred in Palestine, an account is given of the progress of control work with bovine infectious abortion.

Brucella abortus Bang infection in the cow [trans. title], C. F. VAN OIJEN and K. HOFSTRA (*Tijdschr. Diergeneesk., 61 (1934), No. 9, pp. 470–487; Eng., Fr., and Ger. abs., pp. 481, 482*).—The study as here reported led to the conclusion that the rapid macroscopic agglutination test, as introduced by Huddleson and Carlson (E.S.R., 57, p. 672) in 1926, is a reliable method for large-scale testing. By means of the agglutination test, using blood serum and milk serum,

it is possible to detect (1) the animals eliminating *B. abortus* Bang, (2) the infected animals which do not eliminate such bacilli with the milk, and (3) the uninfected animals. Even in highly infected herds the infection can be eliminated in a short time by (1) the eradication of the relatively few animals discharging *B. abortus* Bang with the milk and (2) the separation of the other reacting from the uninfected animals. The authors find that the eradication of the disease in this way is not expensive, the cost being surpassed by the profits obtained from herds free from abortion.

The account is accompanied by a list of 79 references to the literature.

Studies of five Brucella abortus (bovine) strains as immunizing agents against Bang's disease (infectious abortion), W. E. Cotton, J. M. Buck, and H. E. Smith (*Jour. Amer. Vet. Med Assoc., 85 (1934), No. 2, pp. 232–247*).—In this contribution (E.S.R., 69, p. 427) the authors report the results of 2 vaccine experiments in which use was made of 2 avirulent *B. abortus* strains, 2 strains of low virulence, and 1 of high virulence as immunizing agents.

"In the first experiment the immunizing value of 2 avirulent strains and 2 strains of low virulence received consideration. The vaccines were used in connection with virgin heifers of near breeding age and open cows. During pregnancy the vaccinated animals with controls were subjected to *B. abortus* conjunctival exposure. In this experiment the 2 avirulent strains gave evidence of possessing some immunizing value, since but 25 percent of the animals vaccinated with them aborted and 37.5 percent resisted the disease following *B. abortus* exposure that caused 100 percent of the controls to acquire the disease and abort. The 2 strains of low virulence were more effective as immunizing agents, however, since of the animals vaccinated with them 66.6 percent resisted the disease and only 11.1 percent aborted as a result of *B abortus* infection.

"In the second experiment the immunizing value of 3 strains, 1 virulent, 1 of low virulence, and 1 of high virulence, was studied. The vaccines were used in connection with virgin heifers of near breeding age. As in the first experiment, exposure was made to B. abortus during pregnancy by the way of the conjunctiva.

"The results indicate that the avirulent strain which gave evidence of considerably increasing resistance to infection in the first of the 2 experiments was without virtue as an immunizing agent in this one, since 81.8 percent of the animals vaccinated with it acquired the disease following exposure that transmitted the disease to 63.6 percent of the unvaccinated controls. Of the animals vaccinated with the strain of low virulence, 100 percent resisted the disease and of those vaccinated with the strain of high virulence 83.3 percent resisted it. When used in the second experiment, the avirulent strain (801) had been under cultivation 21 mo. longer than when used in the first experiment and apparently the last vestige of its immunity-inducing power had disappeared."

The influence of old strains of Br. abortus upon pregnant heifers, J. H. Norris (*Vet. Rec., 14 (1934), No. 23, pp. 623–631, figs. 10*).—The author has found that "old strains of *Br[ucella] abortus*, cultivated outside the animal body for over 15 yr., when injected subcutaneously into pregnant heifers in doses similar to that used in vaccination against bovine abortion produce infection in all animals which may lead, in some instances, to abortion and udder infection, or to the 'carrier' state with udder infection.

"In a high percentage of cases vaccination of pregnant heifers with old strains of *B. abortus* would probably not result in the exhibition of any clinical signs of infection, although in every case a more or less mild infection would in fact follow and persist for a year or more. It is undesirable to vaccinate

pregnant heifers or cows with living cultures of so-called avirulent or old strains of *B. abortus*, as it is likely to result in a low percentage of the animals aborting or showing udder infection or becoming permanent carriers. Vaccination appears to have no adverse influence on fertility."

Excretion of Br. abortus in milk, J. SMITH (*Jour. Compar. Path. and Ther., 47 (1934), No. 2, pp. 125–133*).—Contributing from the City Hospital Laboratory, Aberdeen, Scotland, the author reports that "in a herd of 84 cows vaccinated with a living culture of *Br[ucella] abortus*, 10, or 11.9 percent, were excreting *B. abortus* in their milk. From 203 random samples of milk from individual cows, 23, or 11.3 percent, were found to contain *B. abortus*. From a total of 287 samples of milk from individual cows, 33, or 11.5 percent, were found to contain *B. abortus*. The greater the serum agglutinin titer for *B. abortus*, the greater is the likelihood of the animal excreting *B. abortus* in the milk. By the agglutination method employed, a whey agglutinin titer of 1:200 or more was significant of excretion of *B. abortus*."

On colpitis granulosa infectiosa [trans. title], E. HENRICSSON (*Skand. Vet. Tidskr., 24 (1934), No. 4, pp. 211–214; Eng. abs., p. 214*).—The author recommends the treatment of this disease in cattle with an autogenous bacterin consisting of streptococci which have been killed by heat, emulsified in a carbolized salt solution to a concentration of 1 billion streptococci per cubic centimeter. The bacterin is injected subcutaneously every third day in increasing doses, as follows: 0.5, 1.5, 2, 2, 2.5, 2.5, 3, and 3.5 cc.

Laboratory and field methods for the detection of mastitis, I, J. M. ROSSELL (*Canad. Pub. Health Jour., 25 (1934), No. 3, pp. 124–130*).—Following a brief discussion of the incidence of mastitis in Canada and a description of the disease, chemical and biological examinations, the catalase test, the chlorine determination test, and the macroscopic and microscopic sediment test are discussed. The author considers the catalase and chlorine tests to be the most efficient, the pH determination next, and the sediment test the least efficient. "Complete agreement in the chlorine and the catalase tests and leucocyte counts was found in nearly 85 percent in our study of approximately 4,200 samples. The pH determination, in this study, repeatedly conducted on the milk of separate quarters, gave poorer results. In some herds this test showed 70–85 percent efficiency in detecting mastitis, but in others the results were disappointing. For testing samples of mixed milk in the laboratory, the best tests are the chlorine and the sediment tests and perhaps the lactose test and, if the milk is not too old, the catalase and pH tests."

Cattle plague anti-serum prepared by intrarumenal hyperimmunisation, S. C. J. BENNETT and J. T. R. EVANS (*Jour. Compar. Path. and Ther., 47 (1934), No. 2, pp. 87–93*).—The authors report upon an attempt made in the Sudan to prepare rinderpest antiserum by intrarumenal hyperimmunization of cattle. "The dosage of virus was double that employed in parallel hyperimmunization of other cattle by the intramuscular route, and was not only 50 percent larger than the dosage employed in Tanganyika Territory but was repeated at shorter intervals. The resultant serum was markedly inferior to that prepared by the intramuscular process, being, in fact, quite incapable at the usual dosage of protecting Sudan cattle against a simultaneous injection of virus. Furthermore, the serum obtained after four or five hyperimmunizations was of no higher potency than that obtained after the first one."

A brief review of the researches on the acute diseases of sheep on the Romney Marsh, A. D. MCEWEN (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 171–181*).—The author calls attention to the fact that there are two acute and fatal diseases "of sheep on the Romney Marsh caused by

anaerobic bacteria. The one, 'struck', is due to an alimentary infection with *Bacillus paludis*, a micro-organism of the *B. welchii* type. The other, 'gangrene' or 'ganger', results from a wound infection, generally with *B. chauvoei*. These diseases do not account for all the cases of sudden death on the Romney Marsh, but no other infectious or contagious disease has been found as the cause of acute illness and death. *V[ibrion] septique*, the causal micro-organism of braxy, has been isolated from the tissues of sheep when the examination was made some hours after death. *V. septique*, however, has not been incriminated as the cause of disease on the Romney Marsh, and no case of braxy has been found. The causal micro-organism of black disease or the German bradsot has been recovered once in the many bacteriological examinations made on material from sheep on the Romney Marsh, but no case has been found resembling black disease or German bradsot.

"The causal micro-organisms of struck, lamb dysentery, and pulpy kidney disease are similar, but lamb dysentery and pulpy kidney disease have not been encountered on the Romney Marsh, and if cases occur these are considered to be few in number. Struck and infectious enterotoxemia, a disease recently described from Australia, are similar types of disease. Methods of active immunization against struck and of passive immunization against gangrene have been investigated."

A list is given of 27 references to the literature.

Contagious ecthyma (sore mouth) of sheep and goats, I. B. Boughton and W. T. Hardy (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 150–178, figs. 2*).—A contribution from the Texas Experiment Station, this study is in continuation of earlier work by Schmidt and Hardy (E.S.R., 68, p. 251).

The authors record work demonstrating the filtrability of the virus, although the filtration is carried out with more or less difficulty, confirming the findings of other investigators of the disease. In the experiments with several animal species only sheep and goats appeared to be susceptible. Animals recovering from an attack of the disease and from experimental inoculation were found to possess a high degree of immunity, although it has not been determined how long the immunity lasts.

"During 1932, controlled field experiments demonstrated that a practical means of preventing the disease had been evolved through vaccination of the young lamb prior to the seasonal occurrence of the disease. Of 7,884 lambs vaccinated, 30 (0.38 percent) developed mild lip lesions subsequently, while 6,667 (65.53 percent) of 10,173 control lambs contracted the disease in a severe form. Results to date of the vaccination of more than 1,339,200 lambs during the present year indicate that vaccination is practical, economical, and dependable."

A list is given of 22 references to the literature.

Foot-rot in sheep: Skin penetration by Strongyloides larvae as a predisposing factor, W. I. B. Beveridge (*Aust. Vet. Jour., 10 (1934), No. 2, pp. 43–51, figs. 2*).—In the experimental work reported in this contribution, 6 of the 8 feet that were treated with larvae of *S. papillosus* and infective material developed foot rot. The 2 feet that did not develop foot rot were exposed to infection for but 2 days as compared with 3 or more days for the other 6. It is suggested that the skin lesions produced by these larvae may provide a portal of entry for pathogenic bacteria.

"Cripples" in lambs, I, II, S. E. Piercy (*Vet. Jour., 90 (1934), Nos. 2, pp. 53–63, figs. 3; 6, pp. 223–231*).—In experimental work from January to August with the disease occurring in the north of England known as "cripples", reported upon by Stewart (E.S.R., 69, p. 275), it was found that "feeding a

special cake rich in minerals and cod-liver oil to 100 ewes chosen at random from a cripples flock did not prevent the occurrence of this disease. The blood of the ewes in the fed and unfed lots showed no significant change. Milk from ewes with crippled lambs was normal, as revealed by chemical analysis. The blood of crippled lambs showed no significant difference from that of healthy lambs. The respective pastures on which the two lots of sheep were grazed, though not rich, were rich enough in those constituents necessary for normal growth as far as could be ascertained from ordinary analyses. Throughout the period of the experiment, both sets of ewes were in good health and robust condition to all outward appearances."

In experiments reported in a second contribution, pregnant ewes were fed in 5 lots of 5 for periods up to 5 mo. on rations of varying mineral content, compounded by adding mineral salts to a basal ration of cornstarch, blood meal, and poor hay. Despite malnutrition and deficiency of phosphorus or calcium, or of both, the lambs were born normal. The majority throve badly as a result of shortage of milk in the ewes, but there were no clinical signs of cripples or of any skeletal abnormality. The condition known as cripples in lambs, therefore, is not deemed to be due to mineral insufficiency of the rations of pregnant ewes, a conclusion supported by a field experiment on a cripples farm in which a mineral supplement failed to reduce the natural incidence of the disease.

Observations on the development of resistance to Dictyocaulus filaria, G. Kauzal (*Aust. Vet. Jour., 10 (1934), No. 3, pp. 100–111, figs. 3*).—In experimental work "young lambs under 2 mo. old exposed either to a light infection with a single dose of 200 larvae, to repeated daily doses of 50 to 100 larvae, or to 5,000 larvae administered in a small number of consecutive daily doses frequently developed resistance to and threw off infection, even though occasionally lambs succumbed to acute lungworm disease under similar conditions.

"Young lambs exposed to infection for the first time may exhibit remarkable variation in individual susceptibility. Lambs 5½ to 7 mo. old exhibit a much higher degree of resistance to first infection than younger animals. Resistance to infection exhibited appears to be due in part to age, and to be acquired in part as the result of prior infection. Resistance of lambs was not markedly affected by periods of 3½ to 11 mo. on a diet so deficient in quality as to lead to cessation of normal growth and even marked loss in weight. Resistance in animals exposed to reinfection either on deficient or normal diets was not affected by concurrent infection with *Haemonchus contortus*.

"It is considered that conditions other than those controlled in these experiments may affect resistance to infection in animals in the field, in view of the incidence in animals of age groups other than those found susceptible to artificial infection."

Field experiments on the immunity of lambs to parasitic gastritis caused by a mixed infection of trichostrongylid nematodes, E. L. Taylor (*Jour. Helminthol., 12 (1934), No. 3, pp. 143–164, figs. 4*).—The observations here reported have led to the following conclusions:

"Lambs are able to acquire an immunity against parasitic gastritis powerful enough to protect them against a rate of reinfection at pasture that is sufficiently great to result in the death of unprotected lambs in less than 7 weeks. This immunity operates against the acquiring of infection but also in enabling the lambs to resist the injurious effects of the infection. Resistant animals may carry more parasites than are carried at the time of death by

nonresistant animals. The immunity is acquired slowly and does not appear to become firmly established for 18 weeks. A gradually acquired infection leads to immunity, while a quickly acquired infection leads to death where the final number of parasites is the same in both instances.

"The immunity is specific and operates more powerfully on *N[ematodirus] filicollis* and *H[aemonchus] contortus* than on *Ostertagia*, *Trichostrongylus*, and *Cooperia*. The immunity has an inhibitory influence on egg laying and on the development of young worms; the egg output of the worms may be reduced to one-thirteenth of the normal. There are marked differences in the reactions of individual lambs, instances of marked resistance and of marked susceptibility having been observed. The symptoms of parasitic gastritis are due to something more than the abstraction of blood by the worm. The part of immunity wihch inhibits the production of eggs by the parasites develops earlier than the resistance to the harmful effects of the infestation."

The stillborn pig, H. C. McPhee and J. H. Zeller (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 224–231, fig. 1*).—This is a report of a study made of pigs dead at birth in a group of 8,991 individuals farrowed in 1,121 litters at the U.S.D.A. Animal Husbandry Experiment Station, Beltsville, Md. The total number of young born dead was 497, which occurred in 259 litters. "Very large and very small litters contained a higher percentage of still-born young than did the litters of medium size. Litters of 1, 2, 12 and above averaged 11.7 percent dead at birth, whereas all other litters averaged 3.9 percent. Pigs dead at birth were significantly higher in weight than pigs born alive. There was no difference in the mean birth weight of live pigs farrowed in litters containing stillbirths and that of pigs farrowed in litters containing only live pigs. The average birth weight of males exceeded that of females by about the same amount, regardless of whether the pigs were born dead or alive. Birth weight was much more variable in the still-born than in the live pigs.

"A brief discussion is given of the probable causal factors concerned in the production of stillbirths, and there is indicated a need for critical investigation of the biological problems involved."

Ascariasis and vitamin A deficiency in pigs, P. A. Clapham (*Jour. Helminthol., 12 (1934), No. 3, pp. 165–176, figs. 9*).—Experiments are reported from which no conclusions are drawn.

Brucella abortion infection in swine in New South Wales, R. O. C. King (*Aust. Vet. Jour., 10 (1934), No. 3, pp. 93–100*).—In the course of investigations conducted, positive reactions to the agglutination test for infectious abortion in pigs were demonstrated. A strain was isolated from a positively reacting sow which exhibited the reactions to *B. suis*. Nine strains of *Brucella* of bovine origin were examined, all of which conformed to the requirements for *B. abortus*. A strain of *B. melitensis* was found to behave typically. The author concludes that a combination of the methods of Huddleson (E.S.R., 62, p. 75) and McAlpine and Slanetz (E.S.R., 58, p. 875) is the best technic at present available for differentiating the species of *Brucella*.

Studies in infectious enteritis of swine.—VIII, Isospora suis n.sp. in swine, H. E. Biester and C. Murray (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 207–219, pls. 2, fig. 1*).—In the course of further studies on the subject (E.S.R., 69, p. 110) the authors have found the sporulation time of *I. suis* to be relatively short. Unlike the *Eimeria* of swine, *I. suis* degenerated very rapidly and sporulated preparations could not be held long in vitro. "Because of this fact, it became necessary to use promptly available pigs which were

older than desired and in which possible previous infections since birth could not be precluded.

"Experimental *I. suis* infections produce anorexia and diarrhea, followed by constipation. Surface desquamation and necrosis of the terminal portion of the substantia propria of the villi of the small intestine, beginning about 2 ft. from the pylorus and extending up to the last 2 or 3 ft. of the ileum, are noted. A pronounced interstitial inflammatory reaction with eosinophilic infiltration of the myelocytic type occurs. *I. suis* and its various stages of sporogony are described.

"The role of this protozoan and the *Eimeria* as pathogens in swine should not be overemphasized. If they are found during the occurrence of a hemorrhagic condition of the intestines, the coccidia should be identified or isolated and subjected to animal tests before attributing the hemorrhagic condition of the intestinal wall to the coccidia present. In such cases encountered by us, the coccidia present did not produce bloody stools when isolated and fed to pigs. Anorexia and diarrhea followed by constipation were observed in the experimentally infected pigs. Attempts to infect guinea pigs and dogs with *I. suis* failed. The swine were not infected by feeding *I. bigemina* from the dog."

Streptococci vegetative endocarditis in a small pig, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 260, 261, fig. 1*).—A case report contributed from the Indiana Experiment Station.

Immunization of guinea-pigs to the virus of equine encephalomyelitis, B. F. HOWITT (*Jour. Infect. Diseases, 54 (1934), No. 3, pp. 368–387*).—In the investigations conducted by the author in California, "different methods of active immunization to the virus of equine encephalomyelitis were tried on guinea pigs, using suspensions of virus attenuated by chloroform, phenol, glycerite of phenol, or solution of formaldehyde, respectively. The results were largely unsatisfactory, although immunity was always present in the animals that survived the intracerebral injections of live virus. On the other hand, successful immunization without fatalities due to vaccination was obtained in several groups of guinea pigs by the simultaneous administration of serum and virus, followed by one or two doses of a suspension of active virus alone. Injections should be made at weekly intervals, and the correct proportions of immune serum and virus should be determined before use by the intracerebral inoculation of guinea pigs. Immunization may be obtained with small doses of live virus alone, when given intramuscularly, subcutaneously, or intradermally, although fatalities due to vaccination may occur. The virus was recovered from the salivary glands of 2 out of 33 immunized guinea pigs 2 weeks and 1 mo. after vaccination, respectively, but was not present in the brain.

"Immunity may be retained in guinea pigs for at least 6 or 7 mo. after the animals received the last injection of virus, even though only one dose is given. The duration of this actual immunity to the disease is not coincident with the development of the antiviral substances in the blood of immunized or of recovered guinea pigs as demonstrated by the in vitro neutralization test. The presence of such antibodies is variable; usually they are lacking, except after hyperimmunization with active virus. They may then be demonstrated within 24 hr. after the stimulating dose is given. Immunity may be conferred on young guinea pigs born either of two immune parents or of an immune mother, but not on those born of nonimmune parents or of a nonimmune female and an immune male. The immunity was demonstrated 2 and 3 days, 2 weeks, and 1 mo., respectively, after birth, while the animals were still with the mothers."

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Tests for cross-immunity between the virus of Borna disease and that of equine encephalomyelitis, B. F. HOWITT and K. F. MEYER (*Jour. Infect. Diseases, 54 (1934), No. 3, pp. 364–367*).—The authors' studies indicate that there is no immunity to Borna disease in susceptible animals "that have recovered from the Californian encephalomeyelitis or have shown immune reactions to the latter, while the giving of injections of the Borna virus to guinea pigs does not render them immune to the other strain. So far the two viruses seem to be immunologically distinct. In considering the reverse experiment, however, that is, the testing of rabbits immune to Borna disease with the virus of encephalomyelitis, immunity to the former seems to afford protection to the other type of virus. This, however, may be more apparent than real because by the time the rabbits had been immunized to the Borna disease and tested for immunity several months had elapsed. The animals had grown in the interval and were undoubtedly still less susceptible to a virus that did not regularly produce the disease.

"It may be stated in conclusion that from certain clinical, histologic, and immunologic observations, it seems tentatively logical to assume that the disease of equine encephalomyelitis described in California is distinct from that known by European writers as Borna disease."

Histological changes in the central nervous system following equine encephalomyelitis, O. LARSELL, C. M. HARING, and K. F. MEYER (*Amer. Jour. Path., 10 (1934), No. 3, pp. 361–374, pls. 2*).—In continuation of earlier studies (E.S.R., 66, pp. 74, 76; 69, p. 592), the authors have found in a histological and cytological study that the brain and spinal cord of horses, guinea pigs, and humans subjected to the virus of equine encephalomyelitis show characteristic pathological changes. The most constant feature is the perivascular infiltration, found in all horses affected by the virus but in none of the controls. It was also present in the guinea pig and human brains that were affected by the virus.

"There are suggestions of intranuclear inclusions in some of the nerve cells in several animals, but in our material this feature is too inconstant to permit of considering them as characteristic features of the affected cells.

"There is considerable degeneration of Nissl substance in many nerve cells of virus-infected animals and also in the human brain. Nerve cells in various stages of necrosis are present, especially in the brain stem and spinal cord. Many nerve cells are in process of phagocytosis by leucocytes.

"Cytoplasmic inclusions are present in many nerve cells of all the animals studied which were affected by the virus, and in the human brain. Similar inclusions are found in smaller numbers in three horses that died from an unknown sepsis and also in a normal horse 12 yr. of age. The number of inclusions in the nerve cells of the virus-infected animals is considerably greater than in the control animals, and appears to be increased by the pathological conditions of the disease."

The immunization of horses and mules against horsesickness by means of the neurotropic virus of mice and guinea-pigs, R. A. ALEXANDER and P. J. DU TOIT (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 2 (1934), No. 2, pp. 375–391*).—A report is given of the results obtained from the injection of horses and mules with neurotropic mouse and guinea pig adapted virus.

"It is shown that the virulence of horsesickness virus progressively decreases for equines as neurotropic fixation takes place by serial passage through mice and guinea pigs. The attenuation occurs more rapidly through the guinea pig, but it is not known whether the ultimate level will not be the same. All animals which survive an injection of one infective dose of neurotropic virus, whether or not a demonstrable reaction is produced, are immune to the

homologous strain of virus. Immunity to heterologous strains is at most only partial. No difference in favor of either the subcutaneous or intravenous method of injection could be determined. It is shown that the subcutaneous injection of as small a dose as 10 cc of a 1:10,000 dilution of infective brain emulsion is adequate. Attention is directed to the phenomenon of a high concentration of infective guinea pig brain emulsion producing a milder reaction than a low but still infective concentration. The possibility of developing a polyvalent vaccine is discussed."

A report of the giant nematode, Dictophyme renale, from a dog, with a summary of American records, P. C. UNDERWOOD and W. H. WRIGHT (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 256–258*).—This contribution is presented in connection with a list of nine references to the literature.

Cystic kidney in a common maltese cat, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 259, 260, fig. 1*).—A case report contributed from the Indiana Experiment Station.

The effect of diet on the course of experimental coccidiosis infection in the chicken, E. E. JONES (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 193–206*).—In experiments here reported, the details of which are presented in tabular form, chickens were maintained on diets differing in their protein and vitamin A content and the effects of infection with *Eimeria tenella* were noted.

"No differences in the course of *E. tenella* infections were observed which could be attributed to the vitamin A content of the diet. Chickens on high-protein diets maintained their weight at a level nearer that of their uninfected controls than chickens on a low-protein diet. High-protein diets may thus be considered as furnishing a reserve which prevents undue loss of weight as a result of coccidial infection. Chickens on high-protein diets developed immunity to reinfection more slowly than birds on low-protein diets. Oocyst production on the basis of number of oocysts per gram of fecal material was greater in chickens on high-protein diets than among birds on low-protein diets, and was still greater on the basis of total counts. The amount and duration of hemorrhage and the mortality were not consistently correlated with diet in these experiments."

Corynebacterium infection in poultry, D. M. YEGIAN (*Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 2, pp. 220–223*).—In the course of examination at the Massachusetts Experiment Station of a Rhode Island Red pullet dead about 12 hr., from which no history of previous sickness or of clinical symptoms could be obtained, the author isolated an organism apparently belonging to but unlike any species of the genus *Corynebacterium* thus far described. A test made on day-old chicks and guinea pigs shows that the organism may prove fatal to these animals under favorable conditions.

"Postmortem examination showed emaciation and anemia. The liver was slightly enlarged. Petechial hemorrhages and numerous necrotic areas, 1 to 3 mm in size, were present. These necrotic areas were slightly elevated and irregularly circular. Direct smears made from liver, spleen, and necrotic areas showed numerous small, gram-positive rods with parallel sides and somewhat rounded ends. The spleen also was enlarged, and minute necrotic areas were present. Excessive precardial fluid, pericarditis, and endocarditis were observed. A general hyperemic condition of the skeletal muscles and viscera was noted."

Fowl-pox vaccine from virus of turkey origin, A. B. CORONEL (*Philippine Jour. Anim. Indus., 1 (1934), No. 2, pp. 85–90*).—The author has found from field use (1) that different lots of chicken and pigeon strains of vaccine have different virulence and potency, while the turkey strain is more uniform, (2) that the degree of immunity depends upon the extent of the reaction

and hence upon the degree of attenuation, (3) that there may be a variation in a strain of virus, which partly explains the fact that a lot of vaccine may be potent in one place and fail in another, and (4) that the potency of the vaccine may be preserved longer by keeping the scabs in their natural condition rather than in powdered form.

Investigations of two outbreaks of laryngotracheitis, J. P. SCOTT and C. A. BRANDLY (*Vet. Alumni Quart.* [*Ohio State Univ.*], *22* (*1934*), *No. 1*, *pp. 23–31*).—In a study by the Kansas Experiment Station of outbreaks of laryngotracheitis in two flocks containing 84 (1931) and 100 (1932) pullets, respectively, it was found that the disease greatly reduced egg production. Of the 63 deaths in the flock of 100 pullets, 18 hens, and 20 male birds, 47 percent occurred during the first 5 days of the disease and 92 percent during the first 10 days. Twenty-three of the pullets remaining in the flock of 84 were found to be susceptible to the disease a year later. It was found that birds exposed to indirect contact or to very short contacts with carrier birds in summer did not contract the disease. Eggs from affected flocks were not shown to carry surface contamination of the virus. "Cloacal vaccination of birds 9 mo. of age resulted in the production of typical laryngotracheitis and death. Eggs from pens containing carrier birds did not hatch as well as eggs from pens free from carrier birds. A few birds were found to be intermittent carriers of laryngotracheitis virus."

Preliminary studies on neurolymphomatosis and some more or less related diseases, C. S. GIBBS (*Massachusetts Sta. Bul. 308* (*1934*), *pp. 31*, *figs. 10*).—The details of the studies of neurolymphomatosis here reported are presented in nine tables. Blood counts made of fowls in a number of flocks indicate that the disease begins with leucocytosis and ends with lymphocytosis, and that during the period of temporary improvement the blood may be normal. "The disease spreads slowly in affected flocks, with only a few birds becoming affected at a time, but new cases continue to develop until it is partially arrested in the late fall. The mortality from neurolymphomatosis is reduced after the first year or two, although it is likely to reappear with each batch of new chickens for an indefinite number of years after it is once established in a flock.

"Neurolymphomatosis and lymphocytomatosis seem to be closely associated. The former is primarily a disease of young birds from 3 to 10 mo. of age, while the latter is more common in birds 10 mo. of age or older. Anemia is a symptom of lymphocytomatosis and leucosis and is not characteristic of neurolymphomatosis. Lympholeucosis is not readily differentiated from lymphocytomatosis. No difficulty was experienced in differentiating neurolymphomatosis from either erythroleucosis or myeloleucosis as the pathological cell is different in all three diseases. The pathological cell appeared to be the same in neurolymphomatosis and lymphocytomatosis, and was characterized by its basic staining properties and the arrangement of the nuclear and chromatin material. This cell was found invading nerves and muscular and visceral tissues by metastatic and direct infiltration. In incipient cases, it first appeared in the capillary spaces and destroyed the nerve fibers and interstitial tissues by utilizing the nourishment for the organization of a tumor.

"Evidence is presented which indicates that incipient lymphocytomatosis and neurolymphomatosis are due to the irritating action of foreign bodies introduced into the peritoneal cavity and tissues. Since bacteria were isolated only from cases in which peritonitis was manifest, the inciting agent is not always bacterial. Attempts to demonstrate the presence of a filtrable virus in neurolymphomatosis and lymphocytomatosis in these experiments failed. Neuro-

lymphomas were most commonly found in the sciatic, vagus, brachial, celiac, optic, and mesenteric nerves; and lymphocytomas were usually located in the ovary, mesentery, kidney, liver, spleen, muscle, and skin. No evidence was found in these studies to indicate that coccidiosis was in any way related to either neurolymphomatosis or lymphocytomatosis. Because of irregularities in the hematology of birds affected with neurolymphomatosis, blood counts were of little assistance in removing diseased birds from affected flocks. On the basis of the experimental data secured in these studies, neurolymphomatosis and lymphocytomatosis may be controlled by eradicating affected birds from the flock as soon as noticed, adopting the best sanitary procedures, and increasing the vigor of the birds by judicious breeding."

A list is given of 27 references to the literature.

Neurolymphomatosis gallinarum, I, II, E. de Boer (*Tijdschr. Diergeneesk., 61 (1934), Nos. 9, pp. 449–462; 10, pp. 520–528, pls. 2, Ger. abs., p. 528; 11, Eng. and Fr. abs., p. 584*).—The first part of this contribution consists of a general review of the subject and the conclusions presented, with a list of 90 references to the literature. In his study of 158 fowls affected with neurolymphomatosis gallinarum, reported in part 2, the author found that "(1) the disease remains confined to young fowls only; birds over a year old are not attacked. (2) Nearly always one leg or both legs are paralyzed. (3) There is a great variety in the symptoms at the beginning of the disease. (4) The initial stage is, in the majority of cases, one-sided. When both legs are affected, there always is a gradual difference unless the last stage (total paralysis) has been reached. (5) The reflexes are lost. (6) The sensitivity of the affected extremity decreases and may finally cease altogether. (7) The disease may be attended with a typical affection of the eyes which, as a rule, manifests itself later than the symptoms of paralysis. (8) From a pathologic-anatomical point of view, the disease is characterized by lesions of the periphar nervous system which consist in swellings and discolorations of the concerning nerves. (9) The possibility of a relationship between this disease and the tumors often encountered, together with the nervous lesions, must be reckoned with. (10) The intestinal parasites do not play a role in the etiology of this disease."

Cultivation of avian-pest virus (Newcastle disease) in tissue culture, T. Topacio (*Philippine Jour. Sci., 53 (1934), No. 3, pp. 245–252*).—The avian pest virus was cultivated by the author in a medium consisting of chick embryo tissue and plasma for 31 generations over a period of 112 days. In such medium the rate of multiplication was expressed by the figures $(1:30)^n$.

"Culture virus did not seem to differ from natural virus in its ability to induce active immunity as shown by the susceptible birds immunized with the former and which resisted the injection of the latter. A vaccine prepared from culture virus gave promise for the development of an active immunizing agent. Culture virus tolerates a considerable amount of contamination, which denotes a high degree of resistance to bacterial encroachment. Beyond a nuclear pyknosis of the epithelial cells, no intracellular change of great significance was noted in growing tissue cells in the presence of active virus."

Stained antigen whole blood test for pullorum disease, P. T. Engard (*Vet. Alumni Quart.* [*Ohio State Univ.*], *22 (1934), No. 1, pp. 18–22*).—The author describes the technic and reports the results of testing work conducted in Ohio in 1933 for pullorum disease of poultry, in which 101 flocks, with a total of 22,450 birds, were represented.

Comparison of the pullorin and the rapid whole-blood agglutination tests for pullorum disease, H. Bunyea (*Jour. Agr. Res.* [*U.S.*], *48 (1934), No. 9, pp. 837–843*).—In continuation of studies of the diagnostic efficiency of

test methods for pullorum infection (E.S.R., 67, p. 459), the author reports upon a comparison made of the pullorin and rapid whole-blood agglutination tests in simultaneous examinations of 860 fowls, largely pullets, in 4 commercial flocks. In 69 percent of the fowls the two tests were in agreement. The tube agglutination test was used post mortem on the serum of birds from three of the flocks. Specimen birds from all of the flocks were examined post mortem and studied bacteriologically. From 45 of the fowls in disagreement that were autopsied and examined bacteriologically 9 reactors to the pullorin and 36 to the stained-antigen whole-blood agglutination tests were found infected. In every group the agreement between the rapid whole-blood agglutination test and the bacteriological findings was more favorable than that between the pullorin test and the bacteriological findings. The results of the tube agglutination test supported the reliability of the rapid whole-blood agglutination test. The data obtained indicate that the pullorin test is not so satisfactory as the stained-antigen rapid whole-blood agglutination test for diagnosing pullorum disease.

Marked fluctuations for the several pullorins used were plainly evident.

A possible new respiratory disease of chickens, W. J. PISTOR, H. A. HOFFMAN, J. R. BEACH, and O. W. SCHALM (*Nulaid News, 11 (1933), No. 4, p. 7*).—An account is given of a disease involving the respiratory system, sinuses of the head, and the eyes, first met with on March 28, 1933, in a flock of 1,100 five-month-old pullets in Sonoma County, Calif. It was observed in a second flock on April 6 and in a third flock on April 11. The course of the disease in the three flocks was prolonged, the loss by June 12 having been approximately 80 percent in the first flock, 70 percent with 33 percent of the remaining birds in a serious condition in the second flock, and about the same mortality in the third flock. The evidence obtained indicates that the disease is either a distinct type of respiratory infection previously undifferentiated or that it is a combination of infectious laryngotracheitis with some other type of infection.

The etiology of a respiratory disease of chickens, O. W. SCHALM and J. R. BEACH (*Science, 79 (1934), No. 2053, pp. 416, 417*).—A study made of a severe type of respiratory infection in chickens first observed in California in 1933 by Pistor and his associates, as previously (E.S.R., 69, p. 863) and above noted, is briefly reported. The symptoms of this affection are said to resemble closely those described by Delaplane, Stuart, and Bunyea of a similar disease of chickens in Rhode Island (E.S.R., 69, p. 435). The authors consider it not unlikely that the two may be identical. It is said that there are also points of similarity between the disease and the coryza studied by Nelson (E.S.R., 69, p. 279; 70, p. 684). The organism isolated and believed to be an etiological factor of the disease appears to differ in some aspects from the one identified by Nelson as the cause of a coryza of chickens, although further studies may show the two to represent a single species.

A hemophilic bacillus as the cause of an infectious rhinitis, J. P. DELAPLANE, L. E. ERWIN, and H. O. STUART (*Rhode Island Sta. Bul. 244 (1934), pp. 12, fig. 1*).—The authors report upon studies made of a new highly virulent respiratory infection first observed in several flocks of chickens and two flocks of pheasants in Rhode Island during the summer of 1932, as previously noted (E.S.R., 69, p. 435; 71, p. 394).

The name *Hemophilus gallinarum* is proposed for the gram negative hemophilic bacillus here described, which is said to be similar to that reported by DeBlieck as the cause of a contagious catarrh of fowl in the Netherlands (E.S.R., 67, p. 170) and of a similar infection reported by Nelson (E.S.R., 69, p. 279; 70, p. 684). It is considered to be the same as the contagious catarrh (DeBlieck) and the uncomplicated coryza (Nelson) except that the

Rhode Island infection is of a more virulent form. While the authors have been unable to study in their laboratory the organism described by DeBlieck, certain morphological and cultural characteristics lead them to consider it to be identical with the culture 5080 of Nelson and the Rhode Island strain of organisms.

Reference is made to the respiratory disease of chickens described by Pistor, Hoffman, and Beach (E.S.R., 69, p. 863) in California, from which hemophilic bacilli have since been isolated.

Subcutaneous inoculation of fowl by the authors with 24-hr. growth of *H. gallinarum* was followed by marked depression which would tend to support their observations of the natural outbreaks, namely, that some toxic agent associated with the infection was perhaps responsible for the high mortalities noted rather than from the respiratory involvement alone.

The organisms colonize on blood agar and bacto hemoglobin plates, maximum growth being obtained after 24 to 48 hr. incubation. The growth on such plates seemed to be favored in an atmosphere charged with moisture.

The subcutaneous inoculation of fowls with a 24-hr. culture of the bacilli resulted in marked swellings at the inoculative point. Twenty-four hours following inoculation depression occurred. Rabbits and guinea pigs have not been susceptible to such infection.

The susceptibility of chickens to human and bovine tubercle bacilli, W. H. FELDMAN (*Amer. Rev. Tuberc.*, *29* (*1934*), *No. 4*, *pp. 400–414*, *fig. 1*).—The author's observations here reported are said to confirm the conclusions of other workers that the domestic hen is remarkably refractory to the organisms of human and bovine tuberculosis.

With a view to securing additional information on its resistance, a series of 48 adult chickens were subjected to infection. "Virulent organisms of tuberculosis, of human and bovine origin, were used to inoculate the animals as follows: By intravenous injection, 30 chickens; by intracerebral injection, 10 chickens; and by intratracheal injection, 8 chickens. After exposure to infection, chickens were frequently given injections of avian and mammalian tuberculin for the purpose of disclosing the existence of an allergic state. The chickens were killed for necropsy at different periods up to 413 days after receiving the infective bacteria. Utilizing the intracerebral method of inoculation, a strain of bacteria of tuberculosis of bovine origin was passed successively in sequence through chickens for five generations. Data obtained seem to warrant the following conclusions:

"Chickens are extremely resistant to the bacteria of human and bovine tuberculosis. Tuberculous lesions can be induced by the intracerebral method of inoculation. Lesions that developed as a consequence of the introduction of large numbers of the bacilli intravenously are never progressive and tend to disappear after a relatively short time. Organisms of human and bovine tuberculosis present in the lesions in the tissues of chickens soon become nonviable and disintegrate. It is improbable that a malignant, progressive tuberculous infection can be induced in chickens by the organisms of tuberculosis that are typically bovine or human in type. The exposure of chickens to organisms of tuberculosis of human or bovine origin provokes an allergic state which can be demonstrated by the intracutaneous injection of mammalian tuberculin. Occasionally a chicken given injections of these forms of bacteria will give a positive allergic reaction following the injection of avian tuberculin. Residence of the organisms of human and bovine tuberculosis within the tissues of chickens failed to increase their adaptability for an avian environment or to enhance their virulence."

A list is given of 15 references to the literature.

Pathological changes induced in chickens by human and bovine tubercle bacilli, W. H. Feldman (*Amer. Rev. Tuberc.*, *29 (1934)*, *No. 4*, *pp. 415–423*, *figs. 6*).—The author reports upon a histological study made of the lesions found in the brain, liver, and spleen of a series of chickens exposed intracerebrally and intravenously to the human and bovine types of *Mycobacterium tuberculosis*. The cytological reaction was that of a definitely tuberculous process, characterized by the occurrence of follicular accumulations of epithelioid cells. After a certain stage of progression the lesions became quiescent and tended eventually to disappear. In no instance did the infectious material initiate an aggressive malignant form of tuberculosis.

The observations led the author to conclude that "chickens are extremely resistant to the organisms of human and bovine tuberculosis. Definite and sometimes extensive tuberculous changes may follow the introduction of the bacteria of human and bovine tuberculosis into the substance of the brain. When exposed intravenously to acidfast bacilli derived from cases of human and bovine tuberculosis, a restricted tuberculous state not infrequently results in the liver and spleen. After an initial period of progression the lesions produced in chickens by human and bovine tubercle bacilli become quiescent and tend eventually to disappear. A progressive, widely disseminated tuberculosis of chickens does not seem possible as a consequence of infection by human and bovine tubercle bacilli. The tuberculous lesion in chickens inoculated with human and bovine bacilli is essentially a spherical collection of epithelioid cells with a peripheral accumulation of lymphocytes."

Some observations on the effect of dietary deficiency on infestation of chickens with the nematode Heterakis gallinae, P. A. Clapham (*Jour. Helminthol.*, *12 (1934)*, *No. 3*, *pp. 123–126*).—In the experiments reported it was found that the mineral matter of the diet significantly affects the fate of *H. gallinae* infestation in chickens.

A study of punctate stippling as found in the lead poisoning of wild ducks, F. M. Johns (*Jour. Lab. and Clin. Med.*, *19 (1934)*, *No. 5*, *pp. 514–517*, *figs. 3*).—In the course of a survey of wild fowl in Louisiana to determine the occurrence and extent of lead poisoning from ingested shot, in which a careful blood survey was added to the routine pathologic examination, numerous specimens showing all degrees of stippling were encountered. The presence of nucleated erythrocytes in fowls enables a direct determination of the degree of poisoning necessary to produce such stippling.

A list is given of 11 references to the literature relating to the subject.

The inheritance of diphtheria immunity in ducks, D. T. Fraser, T. H. Jukes, H. D. Branion, and K. C. Halpern (*Jour. Immunol.*, *26 (1934)*, *No. 6*, *pp. 437–446*).—In their study of inheritance of immunity in birds, the authors found that the "injection of ducks with diphtheria toxoid resulted in the appearance of antitoxin in their blood serum. The amount of antitoxin present showed wide individual variations. The immunity was found to protect against injections of diphtheria toxin. The serum antitoxin decreased rapidly after injections were discontinued. The decrease coincided with the time when the birds began to lay eggs. The eggs were found to contain antitoxin in the livetin fraction of the egg yolk. The concentration of the antitoxin in the yolk was found to vary with the concentration in the serum. . . . Ducklings newly hatched from eggs laid by immunized birds were found to contain antitoxin in their blood serum. None could be found in the serum of 3 weeks' old ducklings from the same mothers."

Eimeria angusta sp. nov. and Eimeria bonasae sp. nov. from grouse, with a key to the species of Eimeria in birds, E. A. Allen (*Amer. Micros.*

Soc. Trans., 53 (1934), No. 1, pp. 1–5, figs. 4).—The author describes (1) the new species *E. angusta* collected from the ceca of *Bonasa umbellus* and *Canachites canadensis* in Labrador and Alaska and (2) the new species *E. bonasae* from the ceca and rarely the small intestine of *B. umbellus* and *Lagopus lagopus* in Massachusetts, Labrador, Province of Quebec, and Alaska. In an addendum attention is called to the fact that since the paper went to press six additional species have come to light, and that they can be differentiated from the two described as new. A list is given of 15 references to the literature.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Texas Station], H. P. SMITH, D. T. KILLOUGH, D. L. JONES, D. SCOATES, B. H. HENDRICKSON, R. W. BAIRD, R. E. DICKSON, and B. C. LANGLEY (*Texas Sta. Rpt. 1933, pp. 115–117, 138–143, 175–177*).—The progress results are briefly reported of investigations on the mechanical harvesting of cotton with cotton harvesters, efficiency in the distribution and placement of cottonseed and fertilizer, soil erosion, and runoff. The two latter investigations are being conducted in cooperation with the U.S.D.A. Bureaus of Chemistry and Soils and Agricultural Engineering.

The quality of the waters of southeastern Nevada, drainage basins, and water resources, G. HARDMAN and M. R. MILLER (*Nevada Sta. Bul. 136 (1934), pp. 62*).—Analyses of a large number of samples of water from an area in southeastern Nevada, including the counties of Clark, Lincoln, White Pine, Nye, Esmeralda, and Lander, are summarized and discussed.

Some water supplies in this area cannot be said to be free from objection on account of the salts held in solution. In many cases there is no indication that such waters are directly harmful, but their alkaline or brackish taste has a tendency to prevent the use of as much as may be needed by the body. In general, the waters are fair for domestic use and good for irrigation. It is noticeable that usually the quality of the waters near the foot of the mountain slopes is better than farther out in the valleys. The waters from the springs and artesian wells in the Las Vegas and Pahrump Valleys are normally of better quality than the surface waters or the waters from the nonflowing artesian wells toward the centers of these basins. The drainage waters in the Las Vegas Valley are very often highly mineralized. The waters of the Amargosa Valley are highly mineralized and of only fair quality for irrigation or domestic uses. The value of the waters for irrigation is lessened by the unusually high sodium content, while the large amounts of dissolved matter impair the quality for domestic use.

The waters of the White River, Geyser, Meadow, Railroad, and Pahranagat Valleys are shown by the analyses to be of good quality for irrigation and domestic uses. The water from the springs in the Moapa Valley is somewhat more concentrated than usual for the White River drainage basin and is not of the best quality for either domestic or irrigation use. However, the water is potable, and when the lands to be irrigated are provided with adequate drainage the water can be used without harm to the soil. The presence of a relatively large percentage of calcium and magnesium in the water appears to prevent the fixation of sodium in the soils on which the water is used, and the sodium is leached out in the drainage water.

Chemically the waters of the Virgin River springs are poor, being so highly charged with salts as to be almost totally unfit for domestic use. Only the very high proportion of gypsum to the other salts makes these waters usable for irrigation, and even with this favorable composition of the salts it appears likely that severe injury to the soil would follow their long-continued use

without the assistance of the annual flushing of the soil with the snow water flow of the river.

In quality, the waters from nearly all sources in the Steptoe Valley are shown to be good for irrigation and fair to good for domestic uses.

The quality of the waters in the Reese River Valley varies within wide limits. In general, the waters in the valley south of Austin, where the contributory mountain ranges are lofty and the run-off high, are good for irrigation and domestic uses. Farther north, toward the center of the basin, the quality becomes poorer, though there are many sources of very good water.

The several streams which enter the upper Big Smoky Valley from the Toyabe Range all have water of good quality. Many springs are found along the west side of the valley where the alluvial slopes are short and steep and the water has but a short distance to travel from its source in the mountains. Practically all of these springs and the artesian wells in the spring areas give water of excellent quality for both domestic and irrigation uses.

A table of definitions and conversion factors is included.

Field irrigation [trans. title] W. Brouwer (*Schr. Reichskurator. Tech. Landw., No. 49 (1933), pp. 83*).—This is a brief treatise on irrigation, largely for truck crop production under German conditions, in which the history of irrigation practice of this general character is reviewed and the results of tests of various methods of field irrigation, including spraying, are brought together from various sources and analyzed in the light of their usefulness to local conditions.

On setting the crest elevation for the Parshall flume, H. A. Wadsworth (*Hawaii. Planters' Rec., 38 (1934), No. 2, pp. 157–159, fig. 1*).—This brief note outlines a procedure by which the proper elevation of the crest of the Parshall flume may be determined before the construction of the device is begun.

Spacing and depth of tile drains, J. H. Neal (*Agr. Engin., 15 (1934), Nos. 6, pp. 194–197, figs. 4; 7, pp. 229–232, figs. 8*).—Studies conducted at the Minnesota Experiment Station are reported which involved observations of four tile drainage systems in different parts of the State on a wide variation of soil types.

It was found that the proper spacing and depth of tile lines is dependent upon three important factors: (1) The type of soil, (2) the types of crops grown, and (3) the climatic conditions. The observations made by the author indicate that the crops were not seriously injured if the water table was held at least 6 in. below the surface and was lowered at the rate of 1 ft. per day through the second 6-in. depth interval and at the rate of 0.7 ft. per day through the third 6-in. depth interval.

Spacing and depth of the tile lines is an exponential function of some physical property of the soil as, for example, (1) the moisture equivalent, (2) the plasticity, and (3) the percentage of clay. This functional relationship to the moisture equivalent is shown in equations.

Neither intense nor long-continued rainfall are, in themselves alone, a reliable index of needed capacity in a drainage system. Heavy subsurface run-off, even when a good outlet is available, does not necessarily follow closely on heavy rainfall. Rather it is dependent on the texture of the soil and subsoil, the soil moisture content preceding the rainfall of which the run-off is a final consequence, and the period of the year relative to plant growth.

The proper determination of the maximum required effectiveness of a tile drainage system should generally be based on soil moisture and run-off conditions present during the early weeks of the growing period. The effectiveness

of a tile drainage system as a protection for and a stimulant of crop growth is manifestly dependent on the rate of drop of the water table at the midpoint between the drains. This rate of drop is dependent on the texture and moisture condition of the soil when well drained and on the depth and spacing of the tile drains, and it is shown in the discussion that both rate of drop and depth and spacing of tile drains are definite functions of the moisture equivalent, the plasticity, or the clay content of the soil under consideration.

It is concluded that the rate at which the water table should be lowered to avoid injury to plant growth should be determined by definite research, because, although a rate of drop of 1 ft. per day through the second 6-in. depth interval is considered desirable, this rate was obtained by the author from general observations rather than from actual determinations of plant growth and yields. Nevertheless the results obtained by the equations presented give tile spacings and depths closely comparable to those recommended by other American investigators, as nearly as can be determined from the general classification of the soils included in their studies.

The method proposed by the author has the following advantages over any other thus far proposed: (1) It is readily applicable by any engineer as it does not call for intricate tests requiring expensive special equipment difficult to secure, and (2) results obtained by the use of these formulas in any locality can be intelligently compared with and definitely checked against results obtained by the same method in any other locality.

Public Roads, [June 1934] (*U.S. Dept. Agr., Public Roads, 15 (1934), No. 4, pp. 85–108+[2], figs. 23*).—This number of this periodical contains the current status of U.S. Public Works road construction as of May 31, 1934, and an article on A Study of Some Liquid Asphaltic Materials of the Slow-curing Type, by R. H. Lewis and W. O'B. Hillman.

Roadside improvement, W. H. Simonson and R. E. Royall (*U.S. Dept. Agr., Misc. Pub. 191 (1934), pp. 35, figs. 54*).—A large amount of popular as well as technical information is presented on the subject, including a partial list of references.

Corrosion of ferrous metals in acid soils, I. A. Denison and R. B. Hobbs (*[U.S.] Bur. Standards Jour. Res., 13 (1934), No. 1, pp. 125–150, figs. 11*).—Studies of the corrosiveness of acid soils toward ferrous metals are reported, in which a laboratory corrosion test was used and corrosion test data on specimens removed from test sites were compared with certain physical and chemical properties of soils. The corrosion data from the field tests include measurements of loss of weight and depth of pits on specimens of a variety of ferrous materials removed after 8 and 10 years' exposure to 37 acid soils.

In a preliminary study of corrosion in a synthetic soil composed of pulverized quartz and agar, it was found that the loss of weight of the test specimens increased markedly with increasing acidity within the range of acidity shown by soils. The low rate of corrosion within the range of mild alkalinity was attributed to the action of an adherent film or layer of ferrous and ferric hydroxides which tended to diminish the accessibility of oxygen to the cathodic surface. The high rate of corrosion in the acid range was explained by assuming that the metal ions diffused readily outward into the soil and that the acidity of the soil neutralized hydroxyl ions as they were formed at the cathode, thereby preventing the formation of a protective rust layer.

Comparison of the average rates of pitting of the field specimens at 10 years indicated that the rates of pitting at practically all of the test sites were determined chiefly by the total acidity of the soil. A similar correlation between the loss of weight of specimens and total acidity was obtained when samples

of soils from the test sites were employed in the laboratory corrosion test. The correspondence between the field and laboratory data suggests the use of the laboratory test as a convenient means of testing the corrosiveness of acid soils. However, because of the effect of pipe-line currents it may be necessary to employ supplementary tests, such as the measurement of soil resistivity.

The pitting factor, defined as the ratio of the maximum depth of pit to the average penetration, diminishes with time and appears to approach a fairly constant value after 8 or 10 years. The pitting factor is shown to be roughly proportional to the ratio of the uncorroded to corroded area on a metal surface.

Measurements of several physical properties of the soil which determine its permeability to air were made in order to relate permeability to the rate of pitting and the distribution of corroded areas. These measurements included the following: (1) Percentage of the total volume of moist soil which is occupied by air; (2) ratio of the moisture required for saturation to the moisture equivalent; and (3) dispersability of silt and clay. Definite correlations were obtained between the values for these properties and the pitting factor, indicating that the greater the permeability of the soil, exclusive of sands, the greater is the tendency for corrosion to be confined to pits, other conditions being the same. An explanation is suggested for the failure of certain very acid and impermeable soils to induce pitting.

Report of the Reinforced Concrete Structures Committee of the Building Research Board, G. Humphreys et al. (*London: Dept. Sci. and Indus. Res., 1933, pp. IV+69, figs. 3*).—The texts of the report and of the recommended code of practice for designing reinforced concrete are given, together with nine appendixes covering among other things certain standard methods of testing both the steel and aggregates of reinforced concrete.

The design of wooden boxes, R. S. Millett (*Canada Dept. Int., Forest Serv. Circ. 39 (1934), pp. 24, figs. 12*).—Technical information is given on the design of boxes, together with instructions on conducting hazard, compression, and drop tests.

The measurement of flame temperatures in a petrol engine by the spectral line-reversal method, S. S. Watts and B. J. Lloyd-Evans (*Phys. Soc. [London] Proc., 46 (1934), No. 254, pp. 444–449, figs. 3*).—Studies conducted at the University of London are briefly reported in which it is brought out that the reversal of a spectral line provides a suitable method for measuring the temperatures which occur during combustion in a gasoline engine. It was found that the maximum temperature in the engine persists for a longer period than the maximum pressure.

Equilibrium volatility of motor fuels from the standpoint of their use in internal combustion engines, O. C. Bridgeman (*[U.S.] Bur. Standards Jour. Res., 13 (1934), No. 1, pp. 53–109, figs. 23*).—This paper reports the experimental data and conclusions from a study conducted over a period of years at the U.S. Bureau of Standards of fuel volatility. An apparatus and method are described for the measurement of the equilibrium volatility of motor fuels, and experimental data are presented on 38 gasolines and blends covering a wide range of volatility.

A correlation is shown to exist between equilibrium volatility data and distillation data obtained by the standard method of the American Society for Testing Materials. By use of the equations deduced it is possible to obtain from distillation data all of the equilibrium volatility data of interest in connection with engine performance.

Power alcohol, F. J. de Villiers (*Jour. So. African Chem. Inst., 17 (1934), No. 1, pp. 24–36*).—Tests are reported which showed that alcohol fuels are

clean burning fuels, showing practically no carbon formation. The fuels do not corrode the engine parts, nor do they cause corrosion of tin-lined fuel tanks. They give higher thermal efficiency, greater power, allow a greater degree of ignition advance, and cause smoother running of the engine. In practice it has been found that the danger of the formation of a 2-layered fuel resulting from the absorption of atmospheric moisture is small. Alcohol-gasoline mixtures can be used in the engine as it is equipped today without any alterations having to be made. These blends can stand high compression pressures without knocking.

Heavy fuels for agricultural tractors [trans. title], C. Boudry (*Ann. Agr. Vaud., 11 (1933), pp. 94–100, fig. 1*).—Tests of four tractor engines are reported, including one burning essence, one burning gasoline, one fitted with a kerosene carburetor and burning kerosene or gas oil, and a fourth of Diesel type and burning heavy gas oil.

The expense of operation increased in the order given. The Diesel engine gave the most economical resutls, followed closely in that respect by the gas engine fitted with a heavy oil carburetor. The latter required a skilled operator, however. The purpose in this case was to adapt an ordinary gas engine tractor to the use of heavy gas oil fuel. Apparently there is some promise in this but it offered the disadvantage of excessive oil dilution at high speeds.

Potato growing with tractor power, A. W. Clyde and R. U. Blasingame (*Pennsylvania Sta. Bul. 306 (1934), pp. 18, figs. 14*).—This bulletin describes in general the research procedure and ultimate results in the development of potato growing with tractor power at the station.

The machinery adaptations are traced in their order, and the field data showing power and labor saving are summarized. Some of the machinery adaptations and mechanical developments to meet special requirements, such as cultivator shovel trips, vine lifters, and the like, are diagrammatically illustrated.

The data presented indicate that satisfactory potato yields can be had with tractor power with a minimum expenditure of power and labor. With tractor power and proper equipment, field operations can be quickly and thoroughly done at the time when they pay best.

Suggested machinery improvements are listed.

The use of the tractor in Trinidad for sugar-cane cultivation, C. R. Massy and D. D. Paterson (*Trop. Agr. [Trinidad], 10 (1933), No. 10, pp. 280–285+V–VIII, pls. 4, figs. 2*).—The use of the tractor for sugarcane cultivation in Trinidad is described, together with the tillage equipment employed. Cost data also are included.

It has been found that on Trinidad sugarcane estates only heavy high-power tractors fitted with a caterpillar track are suited to the type of work to which they are put. Any tractor of less than 30 hp. or of less than 5 tons in weight has been found uneconomical owing to the high maintenance cost and the low power output.

A primer of electricity and heat, M. M. Monroe (*Maine Sta., [1934], pp. 17*).—This mimeographed publication is intended to give the purchaser and user of electrical household devices an elementary understanding of the principles of transportation of electrical power and its conversion into heat, and the principles of heat transfer.

Milking machines [trans. title], C. Boudry (*Ann. Agr. Vaud, 11 (1933), pp. 90–93*).—Tests conducted at the Agricultural Experiment Station of the Canton of Vaud in Switzerland of a portable 2-cow milking machine driven by electric motor are reported.

The results indicate that this machine is time- and labor-saving, but that for average farm conditions the milk contains approximately seven times as many bacteria per cubic centimeter as milk obtained by hand. This is attributed to the difficulty of cleaning the milking parts of the milking machine, particularly under average farm conditions where hot water is not usually available in sufficient amounts or with sufficient frequency.

Second progress report on the development of a small electric milk pasteurizer, A. V. Krewatch (*Maryland Sta. Rural Elect. Proj. Rpt. M–17 (1934), pp. 15, figs. 10*).—This report gives results of investigations in the development of an electric pasteurizer for the use of dairymen producing small quantities of market milk. The studies reported were for the purpose of determining the best materials and proportions for container and electrodes; permissible designs embodying electrical safety, economy, cleanliness, and simplicity; and the determination of the electrical resistance of milk. The maximum permissible power demand was placed arbitrarily at 60 a at 110 v to permit use of the pasteurizer on the ordinary 60-a service.

The results showed that the electrical method of heat pasteurization of from 8 to 20 gal. of milk in a batch-type pasteurizer seems to be entirely feasible. The quality of product is satisfactory, and further tests may show it to be better and more uniform than milk pasteurized by other methods.

The rectangular-shaped pasteurizer with carbon plate electrodes has the advantages of more uniform heat distribution and insulation of electrodes permitting the use of 220 v across electrodes in the larger units. Graphitized carbon proved to be the most satisfactory electrode material.

An accurate, dependable thermal control should be provided. For holding periods of 7 min. or less, this control need only cut off the power and the pasteurizer will require no insulation. For longer holding periods a thermostat with a control sensitivity of 0.5° or less should be used, or the pasteurizer should be thoroughly heat insulated.

Based on these tests, a 10-gal. cylindrical pasteurizer to be used in a 110-v, 60-a circuit should have the following approximate dimensions: Tank 22 in. in diameter by 8 in. deep, with glass plate over bottom; and center carbon electrode 3 in. in diameter by 8 in. long. Such a pasteurizer should heat 10 gal. of milk from 80° to 149° F. in 30 min. with a maximum demand of 50 a.

A rectangular pasteurizer with characteristics similar to the above should be approximately 16 by 12 in. and 14 in. deep, with carbon plate electrodes 13 by 14 by ⅝ in. spaced 11 in. apart. These dimensions would be changed somewhat if the electrodes could be sealed into the ends of the tank.

The homemade fruit washer, H. C. McLean (*Peninsula Hort. Soc. [Del.] Trans., 47 (1933), pp. 87–90, figs. 2*).—In a contribution from the New Jersey Experiment Stations, a home-made fruit washer is described and illustrated. The machine consists of a 2-compartment tank—one compartment for the acid bath and the other for the fresh-water bath. The fruit is propelled through these tanks by paddle wheels. The mechanism can be driven either by a 0.5-hp. motor or by a 1.5-hp. gasoline engine.

Small electric driers for fruits and vegetables (*[C.R.E.A.] Natl. Rural Elect. Proj., College Park, Md., Rpt. M–14, Sup. (1934), pp. 2, figs. 2*).—Practical information is given on the subject in mimeographed form, including service test results on fan-type heating units and data on drier construction.

Greenhouses, beds, and shelters, G. Billault, R. Richard, and H. Nottet (*Quebec Dept. Agr. Bul. 128 (1934), pp. [43], figs. [17]*).—Greenhouses, beds, and shelters adapted to conditions in Quebec are described and illustrated, together with artificial heating equipment.

Methods and costs of filling silos in the North Central States, K. H. Myers (*U.S. Dept. Agr., Farmers' Bul. 1725 (1934), pp. II+22, figs. 5*).—The purpose of this bulletin is (1) to show the elements of cost involved in filling upright silos by different methods and practices, (2) to show the relative importance of these elements of cost and the factors affecting them, and (3) to present a basis for selecting and combining them in such manner as best to fit conditions on the individual farm.

The study was based on data collected in 1928 and 1929 by the University of Illinois in cooperation with the U.S.D.A. Bureau of Agricultural Economics. Records of the cost of filling upright silos were obtained on 87 farms in Illinois on which stationary cutters were used and on 118 farms on which field harvesters were used.

It was found that the cost of filling a silo varies with the type of equipment. The average cost in Illinois was $1.49 per ton on farms where stationary cutters were hired, $1.41 on farms where stationary cutters were owned, and $1.31 per ton on farms where field harvesters were used.

Using a field harvester involves substituting power and equipment for part of the man labor used in filling the silo with the stationary cutter. On an average the investment in equipment was more than twice as high and twice as much tractor power was used when the filling was done with field harvesters, but 21 percent less man labor and 27 percent less horse work were used. Cash costs made one-half the total when stationary cutters were hired, one-third when they were owned, and one-fourth when field harvesters were used. One of the chief advantages of the field harvester is the possibility of using family labor or labor that could not be used so well around a stationary cutter, thus reducing the total cost and the cash cost of filling.

Oil burner heating (*Chicago: Dom. Engin. Pubs., 1934, pp. VIII+174, figs. 74*).—This handbook gives technical information on the planning and installation of oil heating systems. It contains chapters on how to figure cost of heating with either oil, gas, or coal; analysis of oil fuel for oil burners; how to know if air supply is correct; rapid method of figuring oil consumption; what makes for efficiency in installations; the relation of an oil burner to a coal-designed boiler; practical methods of testing burner efficiency; a testing problem worked out; how combustion chambers are made; oil burners under gas boilers; underheated rooms; testing the heating plant in moderate weather; a practical example of testing a heating installation; piping for headroom; how to separate steam and water; bleeder connections when the headroom is low; a trouble job is solved; how to clean a boiler; what is the Hartford loop; how to calculate seasonal heating costs; and how to figure radiation without tables.

Protection from lightning, E. R. Gross (*N.J. Agr. [New Jersey Stas.], 16 (1934), No. 3, pp. 4, 5*).—Brief practical information is presented.

Report of the Water Pollution Research Board for the year ended 30th June, 1933 with Report of the Director of Water Pollution Research (*[Gt. Brit.] Dept. Sci. and Indus. Res., Water Pollut. Res. Bd. and Dir. Water Pollut. Res. Rpt., 1933, pp. III+50*).—The texts of these reports are presented.

In the studies of the disposal of beet sugar factory effluents, strains of bacteria isolated in previous experiments were examined in the laboratories at the Rothamsted Experimental Station with reference to their action on the carbohydrates sucrose, dextrose, lactose, galactose, maltose, levulose, and mannitol, and on the ammonium salts of lactic, acetic, and formic acids. It appears that in general those species most active with carbohydrates also most readily attack the salts of the organic acids. Classification in two groups

according to their action either on carbohydrates or on the salts of the acids has not, therefore, been possible.

Further laboratory experiments have been made on the effects of adding different amounts of phosphate to solutions of sucrose prior to treatment on percolating filters. The solutions, which contained 100 parts of sucrose per 100,000, were filtered at the rate of 100 gal. per day per cubic yard of filtering material. In the absence of phosphate very little biological oxidation of sucrose occurred, but in the presence of phosphate in the amounts added—0.3 and 3.0 parts P_2O_5 per 100,000 in different experiments—active biological films were deposited on the media of the filters; and under certain conditions the biochemical oxygen demand of the treated effluent was less than 2 percent of that of the original solution, a result equivalent to the high degree of purification of more than 98 percent. It thus appears that there may be some advantage in adding phosphate to beet sugar factory effluent to be treated on a percolating filter, especially during the early stages of operation of the filter to encourage the rapid development of the active biological film necessary for efficient purification of the effluent.

Preliminary laboratory experiments on various methods of treatment of effluents containing milk also were carried out. In the first series of experiments it was found that milk diluted with water to contain 1.3 percent of milk can readily be oxidized biologically by filtration through gravel at a rate of 100 gal. per day per cubic yard of filtering medium. The process, however, rapidly diminishes in efficiency owing to the deposition of a thick spongy mass of film in the upper layers of the filter, which in consequence soon becomes clogged. Later experiments showed that this difficulty can be overcome by treatment of the effluent in two stages. In the first stage the effluent is stored in a tank for 1 or 2 days, when fermentation occurs with the separation of fats and protein. The liquid from the fermentation process is then oxidized in percolating filters. Further experiments are in progress with the object of ascertaining the conditions necessary for maximum efficiency of purification.

Preliminary experiments also were made at the Rothamsted Experimental Station on the biological oxidation of aqueous suspensions of cellulose, in the form of wood pulp, by means of percolating filters and by the activated sludge process. This work was undertaken because cellulose is an important constituent of domestic sewage and of certain trade wastes. Under the conditions of the experiments, very little of the cellulose in a suspension containing 50 parts per 100,000 in distilled water was oxidized by the activated sludge process. With percolating filters the results were much more satisfactory, and approximately 70 percent of the cellulose was oxidized when the suspension was filtered at a rate of about 100 gal. per day per cubic yard of filtering material.

Notes on the chloramine treatment of water, S. Elliott (*Jour. Roy. Army Med. Corps, 61 (1933), No. 3, pp. 161–179; abs. in Bul. Hyg., 8 (1933), No. 12, pp. 817, 818*).—These notes relate primarily to the treatment of small scale water supplies. The ammonia may be used in the form of gas from cylinders, but care must be taken to keep the ammonia gas away from the chlorine gas until they are mixed in dilute solution.

The chloride and sulfate of ammonia are convenient salts to use instead of the gas. Chlorine may be used as gas or as bleaching powder or as any of the other commonly used chlorine substances, provided the percentage of available chlorine is known. The ammonia and chlorine may be mixed and then added to the water, or the ammonia may be added first and after a

thorough mixing the chlorine may be added subsequently. The proportions of the two substances required are in both cases about 4 parts of chlorine to 1 part of ammonia.

Experiments showed that chloramine will kill *Bacterium coli* when in a concentration of 1 p.p.m. of either river water or in filtered mixtures of sewage and water. It is not so rapid in its action as chlorine and has no greater penetrative power.

The sanitary disposal and agricultural utilization of habitation wastes by the Indore process, F. K. JACKSON and Y. D. WAD (*Inst. Plant Indus., Indore, Cent. India, Bul. 1 (1934), pp. [1]+26, figs. 8*).—The present efficiency of disposal and utilization of habitation wastes in India is discussed, and the essentials of the so-called Indore system are described.

The main features of the Indore process are (1) the immediate treatment of both the refuse and night soil, one after the other as soon as they arrive at the disposal grounds, the carts being backed to the edge of a trench 2 ft. deep and 15 ft. broad; (2) the addition of half-rotted compost in small amounts as a starter; (3) lightly spreading by suitable long-handled rakes in thin layers so that they may become mixed; (4) a rapid rise of temperature (usually to above 50° C. and never below 45°) which persists up to the third turn and kills pathogenes and fly larvae; (5) the restoration of air three times by turning with a digging fork to insure steady and intense microbial activity and to kill (by burying in the hot mass) any maggots that may hatch out at the exposed cool edges of the heaps. The periods between turning are short enough to prevent any such larvae developing into flies and to reduce the chances of their crawling out in wet weather to shelter and pupate in the bottom and sides of the trench; and (6) the replenishment of lost moisture by adding water, if needed, at the times of turning.

The advantages of this process have been found to be (1) low capital outlay and operating costs, (2) a net profit from the sale of manure, (3) simple construction of permanent trenches not requiring professional engineering knowledge, (4) economy in disposal ground area, (5) the prevention of offensive odors and fly breeding, (6) the process can be worked in the open without cover in all seasons, even during continuously wet seasons with 47 and 52 in. of rain and heavy falls of nearly 6 in. in 24 hr., (7) no need of skilled supervision, (8) exceptional cleanliness at the disposal grounds, (9) the short period required for complete decomposition to a rich manure in large quantities, which is safer for crops than ordinary poudrette, (10) the surplus income becomes available for other sanitary measures for improving public health, and (11) it is equally applicable to large or small communities.

An appendix gives technical detail. Notes on the sanitary aspect are also given by J. R. J. Tyrrell and M. A. Nicholson.

A septic tank for farm homes, H. L. BELTON and J. P. FAIRBANK (*Calif. Agr. Col. Ext. Circ. 82 (1933), pp. 20, figs. 17*).—Practical information is given on the subject together with drawings of equipment. This circular supersedes Circular 270 of the California Experiment Station (E.S.R., 51, p. 89).

AGRICULTURAL ECONOMICS

Research in progress in the Bureau of Agricultural Economics, July 1, 1933 (*U.S. Dept. Agr., Bur. Agr. Econ., 1933, pp. II+86*).—This is a list of the 250 research projects in progress in 13 divisions of the bureau in July 1933. The title, objective, personnel, cooperation, date of beginning, and probable date of completion are included for each project.

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[Investigations in agricultural economics at the Georgia Station, 1933–34] (*Georgia Sta. Rpt. 1933–34, pp. 31–37*).—Included are data regarding length of staple of cotton produced in Georgia in 1933 and 1934 obtained in a continuation of the study previously noted (E.S.R., 69, p. 605) and statements as to plans for work on tax delinquencies and land transfers in cooperation with the U.S. Department of Agriculture and the U.S. Civil Works Administration and on land use planning and rural reorganization in Georgia in cooperation with the U.S.D.A. Bureau of Agricultural Economics.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 169 (1934), pp. 164, 165*).—Two articles are included as follows:

Farm incomes in 1933 as compared with 1932, G. W. Miller and J. I. Falconer (p. 164).—A table shows for 96 farms in 7 counties in the north central part of the State the average cash receipts for different crops and different kinds of livestock, etc., the cash operating expenses by items, the net cash income, inventory changes, and farm income.

Index numbers of production, prices, and income, J. I. Falconer (p. 165).—The table previously noted (E.S.R., 71, p. 715) is brought down through April 1934.

Current Farm Economics, Oklahoma, [August 1934] (*Oklahoma Sta., Cur. Farm Econ., 7 (1934), No. 4, pp. 53–74, fig. 1*).—Included are reviews of the general agricultural situation, by E. L. McBride (pp. 55, 56), and of the farm situation in Oklahoma as shown by farm records, by P. Nelson (pp. 65–67). Articles are also included entitled Oklahoma Farm Taxes Have Been Markedly Reduced from 1930 to 1933, by J. T. Sanders (pp. 57–62); Some Social Aspects of the Restriction of Agricultural Production, by O. D. Duncan (pp. 62–65); Results Achieved by One-Variety Cotton Communities in Oklahoma, by R. A. Ballinger and C. C. McWhorter (pp. 68–71); The Operation of the Bankhead Act in Oklahoma, by H. P. Moffitt (pp. 71–73); and The Oklahoma Agricultural Cooperative Council, by Ballinger (pp. 73, 74).

[Investigations in agricultural economics at the Texas Station, 1933] (*Texas Sta. Rpt. 1933, pp. 92–100*).—Results of investigations are reported on organization and management of farms in the high-plains cotton area of Texas, by C. A. Bonnen (pp. 92, 93); local cotton marketing, by L. P. Gabbard and W. E. Paulson (p. 94); mixed carlot movement as a factor in the economic distribution of Lower Rio Grande Valley fruits and vegetables, by Paulson (pp. 95, 96); quality as a factor in the marketing of vegetables in the Lower Rio Grande Valley of Texas, by Paulson (p. 96); central and local market prices of wheat in relation to quality, by Paulson, G. S. Fraps, and R. T. Stewart (p. 97); farm tax index for Texas, by Gabbard (pp. 97–99); classification of property in Texas, by Gabbard (pp. 99, 100); and economic significance of different methods of harvesting cotton, by Gabbard and D. L. Jones (p. 100).

Assessment of farm real estate for taxation purposes in Brown County, South Dakota, P. Hansen (*South Dakota Sta. Circ. 18 (1934), pp. 16, figs. 2*).—This is a study of the practice in South Dakota of fixing assessment values of farm real estate annually. Analyses are made (1) of the relationship between the average assessments per quarter section (160 acres) in 1909, 1912, and the odd-numbered years from 1915 to 1931, inclusive, in 15 townships of Brown County, (2) of the variations in changes in assessments per quarter section in 6 townships during each 2-year period from 1919 to 1931, inclusive, and (3) of the differences between the changes in average assessments on land with high and with low average assessment values. Some of the findings follow:

The average assessments in the townships studied showed little change relative to one another during the period. In the case of assessments per quarter section in the 6 townships, the largest number decreased or increased by approximately the same percentage. Townships with a low average assessed value tended to show the greatest range in the percentage change which took place in each quarter section during the periods studied. Townships with high average assessments decreased faster in assessed value since 1921 than those with low assessment.

The author concludes that assessments could be made less frequently than annually, and states that "a period of 5 yr. between each general assessment year but with corrections every year for property showing a change in assessed value of 5 to 10 percent may prove just as equitable and efficient as the annual assessments and perhaps with a lesser expense to the taxpayer."

Farm mortgage foreclosures in South Dakota, 1921–32, H. A. Steele (*South Dakota Sta. Circ. 17 (1934), pp. 11, figs. 4*).—This circular continues the study previously noted (E.S.R., 69, p. 603). Included are tables, charts, and maps showing by years 1913, 1918, and 1921–32 the number of farm foreclosures instituted, the acreage and the percentage of assessed acreage involved, the indexes by years of the number of foreclosures, the relation of the acreages involved in foreclosures to the acreages assessed by counties and by types of farming areas, and the number of farms and acreage involved in foreclosures by counties each year from 1921 to 1932, inclusive.

The utilization of El Dorado County land, D. Weeks, A. E. Wieslander, and C. L. Hill (*California Sta. Bul. 572 (1934), pp. 115, figs. 15*).—The results of the first large-scale study in California of land utilization and of the complex problems arising out of its relations to the economic and social structure are dealt with in this bulletin. The investigations were made in cooperation with the Forest Service, U.S.D.A.

The character of the land and the forest and other vegetative cover of Eldorado County; the utilization of lands for orchard crops, irrigation, and the general characteristics of and costs and returns in livestock farming; the productivity of forest lands; the relation of lumbering industries, hydro-electric power, mining, and fruit-packing plants; recreational uses of land to land use; county expenditures for roads and schools as affected by land utilization; and what land-use planning involves are discussed.

On the basis of the various factors discussed, an economic classification is made of the lands into five areas as follows: Fruit production supplemented by forest crop and manufacturing industry, potential farm and/or forest crop, livestock production, forest crop with recreation and grazing, and recreation with forest crop and grazing. Each area is described briefly and a program of utilization suggested. The means by which land utilization may be improved are discussed.

An economic study of land utilization in Tompkins County, New York, A. B. Lewis (*[New York] Cornell Sta. Bul. 590 (1934), pp. 58, figs. 12, map 1*).—The purpose of this study was to determine the location and extent of areas of land adapted to different degrees of intensity of use, to suggest plans for developing the resources of different areas, and to determine the relationship between the intensity of use to which different classes of land are adapted and various other factors. Using the character of the soil, the use of the land and the condition of buildings as the principal factors, the lands of the county are divided into five classes according to the intensity of present and probable future uses. Comparisons are made of the farm businesses in the different land classes for 1927 and 1907 and of wages of hired men and school teachers

value of farm operators' time, farm tenancy, assessed valuations of real estate, tax rates, tax delinquency, cost of rural schools, outdoor relief to the poor, farm fire insurance, and first-mortgage loans on farms in the different land classes.

The development of roads, rural electrification, rural residential development, and reforestation in the different classes and also desirable shifts in type of farming are discussed.

Types of farming in Illinois: An analysis of differences by areas, H. C. M. CASE and K. H. MYERS (*Illinois Sta. Bul. 403 (1934), pp. 93–226, figs. 41*).—"The objects of this bulletin are (1) to portray in a general way the agriculture in the State by showing the kind and proportion of crops and livestock produced, (2) to delineate areas within which certain combinations of crops and kinds of livestock predominate, and (3) to show how the predominant types of farm organization in an area are related to the conditions existing in the area." The study is based on data of the Bureau of the Census, U.S. Department of Commerce; the Weather Bureau and the Bureau of Agricultural Economics, U.S.D.A.; the Illinois State Department of Agriculture and the Illinois State Geological Survey; and information gathered by various departments of the station. The natural conditions affecting and the general development of Illinois agriculture, the utilization of land, the economic and biological forces influencing types of farming in the State, and the field crop, fruit, vegetable, and livestock production in the State are described and discussed.

On the basis of the data the State is divided into nine dominant types of farming areas. Each area is described, giving information on such items as types of farms, crops grown, factors influencing the type of development, size and number of farms, farm tenure, etc.

Types of farming in Pennsylvania, E. RAUCHENSTEIN and F. P. WEAVER (*Pennsylvania Sta. Bul. 305 (1934), pp. 63, figs. 36*).—This bulletin is based chiefly on the 1930 and previous reports of the U.S. Bureau of the Census; results of surveys of farm management and farm accounts; general, regional, and detailed county soil maps; data as to climate, mineral resources, forests, industries, and price trends of farm products; etc. The study was carried on in cooperation with the U.S.D.A. Bureau of Agricultural Economics.

The factors affecting agriculture, the development of and present situation in Pennsylvania agriculture, the cropping systems, crops grown, livestock enterprises, etc., are described. Maps show the distribution by townships of individual farm enterprises and the types of farming based on sources of income as shown by the 1930 Census. Other maps show the predominant and second most predominant types of agriculture in different localities and the boundaries of 25 more or less distinct type-of-farming areas into which the State may be divided. Each of these type-of-farming areas is briefly described.

The trends in Pennsylvania farming that appear significant and worthy of consideration by those engaged in or contemplating farming are enumerated.

Factors for successful farm management in Todd, Christian, and Warren Counties, W. L. ROUSE (*Kentucky Sta. Bul. 347 (1934), pp. 17–48*).—This report is based upon a business analysis for 1929 of 303 farms in the limestone area of southwestern Kentucky. Tables and text show (1) the tenure status of the operators and types of farming for the 303 farms, (2) for all the farms and for those in each county the acreages of different crops, average number of different kinds of livestock, average capital investment by items, farm receipts from different sources, perquisites furnished by farm to

family living, farm expenses by items, and a farm business summary, and (3) some of the factors of efficiency for all farms compared with those for the 35 most and 35 least profitable farms. An analysis is made of the relations of the following factors to labor income and operator's earnings: Receipts per acre, crop index, productive man work units per man, acres in intensive crops, size of farm, and productive animal units per 100 acres. The organization and management used by six successful farmers are described.

The average labor income for the 303 farms was $1,552, and the average operator's earnings $2,179. Labor income per farm increased from $32 for the farms with receipts of less than $10 per acre to $2,985 for those with receipts of $30 or more per acre, from $321 for the farms with a crop index of less than 75 to $2,418 for those with a crop index of 125 and over, from $979 for the farms with less than 200 productive work units per man to $2,232 for those with 300 and over such units per man, from $774 for the farms of less than 7 acres of intensive crops to $4,436 for those of 28 or more acres of such crops, from $588 for the farms of less than 150 acres operated to $2,886 for those of 350 acres or more operated, and from $1,237 for the farms with less than 5 productive animal units per 100 acres to $1,861 for those with 7.5 or more such units per 100 acres.

Adjusting central Indiana farming to corn borer conditions, G. W. Collier and L. Robertson (*Indiana Sta. Bul. 389 (1934), pp. 36, figs. 13*).—This bulletin, prepared in cooperation with the U.S.D.A. Bureau of Agricultural Economics, describes and discusses the possibilities of corn borer control in Indiana through changing crop rotations and practices. What constitutes effective corn borer control, crop rotations and practices of harvesting and seed-bed preparation common in central Indiana, livestock and corn borer control, and preparing for the corn borer are discussed, as well as the adjustments on individual farms that should result in higher incomes under conditions of serious corn borer infestation in the neighborhood, using a 125-acre farm with a corn, wheat, and clover rotation; a 92-acre farm with a corn, oats, and clover rotation, using horses for power; a 386-acre farm with a corn, corn, oats, and clover rotation, using horses and tractors; and a 236-acre farm with a corn, corn, soybean, wheat, and clover rotation.

How use contracted acres under the wheat and corn-hog reduction programs? J. C. Hackleman and C. M. Linsley (*Illinois Sta. Circ. 420 (1934), pp. 20, figs. 6*).—"Thirty-three of the more important questions raised by Illinois farmers about the use and management of the acres which they have contracted to the Secretary of Agriculture under the wheat and corn-hog reduction programs of the Agricultural Adjustment Administration are answered in this circular."

Adjustment problems in wheat production, H. H. Finnell (*[Oklahoma] Panhandle Sta., Panhandle Bul. 54 (1934), pp. 3–13*).—It is the purpose of this report to summarize under one heading all the available information on the subject of crop management which may be of value in working out the most effective adjustment relative both to the collective needs of the industry as a whole and to the natural conditions of the Panhandle area. Three methods of increasing the productive efficiency in wheat growing demonstrated by experiments by the station at Goodwell were (1) simple crop rotation using a crop to precede wheat which provided a favorable moisture and fertility condition for fall sowing, (2) a variable modification of the rotation idea in which wheat was sown only when weather and soil conditions indicated a favorable prospect and a grain sorghum was introduced to make use of production opportunities that did not fit into the requirements of wheat, (3) the conservation of surface

run-off water by terracing to increase the effective moisture supply. Considering only cash savings and increased productive efficiency it was found the desired reduction in production could be made, using any one of the three methods, without sacrificing income possibilities. The most efficient production was secured by the variable system. Since the primary function of moisture control operated to some extent independently of the principle of variable cropping a profitable combination of methods was indicated.

Cost of producing onions, J. W. CARNCROSS (*N.J. Agr.* [*New Jersey Stas.*], *16* (*1934*), *No. 3, pp. 6, 7*).—The costs, labor requirements, yields, receipts, etc., found in surveys made in Cumberland County in 1926–27 and 1932–33 are briefly summarized.

Production and marketing of redtop, including a study of the place of redtop in the organization of southern Illinois farms, W. L. BURLISON, C. L. STEWART, R. C. ROSS, and O. L. WHALIN (*Illinois Sta. Bul. 404* (*1934*), *pp. 229–299, figs. 24*).—"About 85 percent of the world's supply of redtop seed and 95 percent of the total redtop seed in the United States is produced in a dozen counties in southern Illinois, and has been produced there since about 1875."

The cultural practices in growing and harvesting redtop in this area, the production of redtop—seed, straw, hay, and pasture, the disposition made of the crop, and the competition between redtop and other grass seeds are described. The methods and problems of marketing redtop seed through local dealers and cooperative associations, marketing by wholesale dealers, retail marketing, and recent efforts to stabilize marketing are discussed. An analysis is made of prices received by producers, wholesalers, and retailers during a period of years and the effects of production, total supply, and disappearance on such prices.

In the study of the place of redtop in the organization of southern Illinois farms, the relative profitableness of redtop, the organization of redtop farms, redtop in the cropping system, its competition with other crops, the effects of cash-outlay requirements on the use of redtop, and the place of redtop in the future adjustments in the area are discussed, and an analysis is made of the business records kept on farms in the redtop district during the years 1928–32.

Marketing vegetables produced on northern Indiana muck soils, F. C. GAYLORD and H. M. CLEAVER (*Indiana Sta. Bul. 392* (*1934*), *pp. 19, figs. 7*).—This is a study of factors affecting the marketing of the 1932 crop of vegetables grown on the muck lands in northern Indiana, especially cabbage, celery, and carrots. It is based on data collected through personal interviews with growers, dealers, and transportation agencies. In general, the tables and discussion deal with the acreage and production of the different vegetables by counties; the freight rates on each vegetable from Indiana and competing States to leading markets; the sales from the area studied at the farm and at canneries and to wholesale dealers, retail grocers, and consumers; and car-lot receipts on markets in Indiana and nearby States.

Cooperative shipping of eggs in a general farming community of Indiana, E. R. MENEFEE (*Indiana Sta. Bul. 390* (*1934*), *pp. 16, figs. 4*).—The operation and results of a cooperative egg shipping association of the type previously discussed (E.S.R., 67, p. 764) but in a general farming community are described. The size, number, and distribution of flocks around the loading point, number of shippers, effect of quality of eggs on New York City prices received, egg quality at the loading point, and the deterioration in quality from the farm to New York City are discussed. Temperature data from the refrigerator cars, which were not iced, are included.

From May 4, 1931, to April 24, 1933, the association shipped 104 cars—36,833 cases—of eggs. The average cost of shipping, including cases, freight, and loading, was 3 ct. per dozen. The average net price received in New York City was 16.8 ct. per dozen, as compared with an average price of 13.2 ct. which would have been received if the eggs had been sold locally.

Consumption of certain perishable farm products in Albany, New York, W. C. Hopper (*[New York] Cornell Sta. Bul. 586 (1934), pp. 52, figs. 10*).—"The purposes of this study were: (1) To determine the effect of family income, size of family, number of children, occupation of head of household, and other factors, on the amount spent for fresh fruits, fresh vegetables, eggs, and poultry consumed in the households in the city of Albany; (2) to learn the relation of family income, number of children, nationality, and other factors to the use made of different distributing agencies as sources of supply of perishable farm produce for Albany householders; (3) to obtain facts on the volume of fresh fruits, fresh vegetables, and poultry products purchased for consumption in Albany hotels and restaurants." The data were obtained in connection with the study previously noted (E.S.R., 71, p. 412). The study of the consumption in households is based on information obtained from 1,020 families for the year ended September 1, 1930, and that of the consumption by hotels and restaurants on data obtained from proprietors, managers, and produce buyers of 85 hotels and restaurants regarding their expenditures during the same year.

The data obtained from the households are analyzed so as to show the relations of income, size, number of children, occupation of head of household, and nationality to the total consumption and sources of supplies of fresh vegetables, fresh fruits, eggs, and poultry. Special attention is given to the effects of distance of the household from the public market upon the purchases in that market.

The data for the hotels and restaurants are analyzed to show the sources of supplies of fresh vegetables, fresh fruits, poultry, and eggs; the purchases from the public market; and the estimated number of meals served by hotels and restaurants in the city.

RURAL SOCIOLOGY

Recent trends in the rural population of Ohio, P. G. Beck (*Ohio Sta. Bul. 533 (1934), pp. 41, figs. 3*).—This bulletin, based mainly on census data, presents a brief analysis of the historical and recent changes in the population of Ohio, together with a statement of some of the current problems.

"Since the Civil War, the general trend of population movement has been away from the rural districts and agriculture toward the urban industrial centers. The comparatively high birth rate of the rural population, improved agricultural technology, and the pull of cities which required immigration for growth were responsible factors. Between 1920 and 1930 rural Ohio sent upward of 200,000 persons 15 yr. of age and over to the growing industrial centers. . . . These migrants brought to the cities youth, strength, brains, ambition, training in habits of work and thrift, and property rights in rural wealth. The rural districts from which they migrated were left with abnormal proportions of young children and aged people. The number of young adults left in the community was often too small to maintain satisfactory social life. . . . Often the population became too sparse and the wealth too meager to support the necessary community institutions. Many communities never recovered from the drain of population and wealth thus placed upon them.

"During the period since 1929, the circumstances arising out of the economic depression have reversed the tide of rural-urban migration. Unemployment

and heavy relief burdens in the cities have turned the faces of an increasing number of people toward the land as a source of subsistence. They have returned to the farms and to the villages, and the growth of part-time farming appears imminent. If prosperity returns to the cities, the tide of immigration will again reverse itself. If prosperity does not return to the cities, they will cease to grow, since their populations do not reproduce themselves. Meanwhile, these return migrants present a heavy burden for the farm population to support. Thus, the rural districts appear not only as the chief source of population increase, but also as an important source of subsistence in times of economic stress."

FOODS—HUMAN NUTRITION

[Studies in food and nutrition at the Georgia Station] (*Georgia Sta. Rpt. 1933–34, pp. 48, 49, 50, fig. 1*).—This progress report deals with studies on the effect of quick freezing and frozen storage on the vitamin A and G content of milk, the extent to which the hen can utilize the carotene of the pimiento as a source of vitamin A in the egg, the value of the pimiento as a source of vitamin A in the human diet, and the culinary properties of pimiento eggs (E.S.R., 71, p. 127).

Analyses of cooked meats deprived of visible fat, M. I. Hanna (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 3, pp. 188–198*).—The method followed in most of the analyses reported consisted in first extracting the fat in a Soxhlet apparatus from duplicate 2-g samples of the meat with all visible fat removed and then using the fat-free meat for the usual nitrogen determinations. This technic was adopted after preliminary comparisons of the percentage of protein in six different lots of cooked meat before and after fat extraction had shown insignificant differences. Data are reported on 7 samples of beef cooked in different ways, 1 each of calves' liver, duck, and salmon, 2 each of tongue, sweetbreads, veal, lamb, ham, bacon, and turkey, 3 each of pork and chicken, and 4 of rabbit. In most cases of well-cooked meat deprived of visible fat the protein content was not far from 30 percent and the fat approximately 5 percent. The light meat of fowl and rabbit contained even less fat.

Shortening value of plastic fats, J. D. Fisher (*Indus. and Engin. Chem., 25 (1933), No. 10, pp. 1171–1173, figs. 5*).—In this study of the relative shortening value for plain pastry of some common fats, three series of experiments were run, using a standard procedure for mixing, rolling, and baking pie crust in the form of small wafers which were tested for breaking strength in a shortometer. In each series 1,000 breaking tests were made for each fat, and the data were subjected to statistical examination.

In the first series the fats tested were, in decreasing order of their shortening value with refined steam-rendered lard considered as 100 percent, hydrogenated lard and animal stearin-vegetable compound 74 each and two samples of hydrogenated oil 73 and 70 percent. In the second series slightly more fat for a given amount of flour was used, and an additional fat, a vegetable stearin-vegetable oil, was tested. The shortening values, again in decreasing order with refined steam lard as 100 percent, were vegetable oil compound 83, hydrogenated lard 76, hydrogenated cottonseed oil 75, animal stearin-vegetable compound 75, and the second sample of hydrogenated cottonseed oil 71 percent.

In the third series the same proportions of fat and flour were used as in the second, and the fats tested consisted of 3 samples of refined steam-rendered lards, 2 of open-kettle leaf lard, and 1 of the hydrogenated cottonseed oils of the previous series. The values for the 2 new steam-rendered lards were 102 and 101 percent, for the leaf lards 91 and 90, and for the hydrogenated cottonseed oil 69 percent.

Nutritive value of various types of cheese, R. B. McCammon and M. M. Kramer (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 4, pp. 292–294*).—In this contribution from the Kansas Experiment Station, previously reported data on the nutritive value of various types of cheese (E.S.R., 70, p. 238) have been arranged according to Rose (E.S.R., 62, p. 90) to show the protein, calcium, and phosphorus content in grams, "shares", and 100-calorie portions of pound, ounce, and gram quantities.

The relation of the quality of vegetables to the waste incurred and the time used in their preparation, P. M. Nelson and G. P. Crouch (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 2, pp. 107–119*).—Useful information is summarized on the waste incurred and the time required in the preparation in large quantities of a number of vegetables of varying quality from poor to very good.

Bacterial studies of defrosted peas, spinach, and lima beans, E. B. Brown (*Jour. Home Econ., 25 (1933), No. 10, pp. 887–892*).—Samples of fresh peas, spinach, and lima beans were obtained, and one portion of each was frozen by exposure to dry ice and another held in the fresh state. Samples were also obtained of the same vegetables commercially frozen by the Birdseye process. All of the samples were placed in sterile cotton-stoppered flasks and held for periods of from 12 to 72 hr. at 22° and 6° C. At the beginning of the experiment and at the end of each time interval quantitative bacterial counts were made as a measure of the extent of spoilage.

As thus judged, the fresh samples spoiled in from 2 to 4 days, depending upon the initial condition of the product. Similar specimens frozen in the laboratory and then defrosted spoiled after 12–24 hr. at 22° and from 36 to 48 hr. at 6°, the spinach deteriorating most rapidly. The commercially frozen specimens spoiled after 12 hr. at 22° and from 24 to 36 hr. at 6°, the spinach and lima beans spoiling more rapidly than the peas.

"Whether the more rapid spoilage of the commercially frozen vegetables was due to the use of poor quality vegetables for freezing, to contamination during the process, or to an increase in the numbers of bacteria during storage is not known. It is logical to suppose, however, that a product having a high initial count would spoil more rapidly and might soon become unfit for consumption. The organisms isolated from the fresh vegetables were mostly nonpathogenic micrococci and spore-forming bacteria. A few nonspore-forming rods and sarcinae were encountered. The proportion of spore-forming rods to other types had greatly increased in the frozen vegetables. *Flavobacteria*, achromobacter, diplococci, streptococci, and organisms of the colon group were also isolated."

Fig-products investigations, H. M. Reed (*Texas Sta. Rpt. 1933, pp. 148–150*).—This progress report (E.S.R., 70, p. 272) includes a comparison of sun-drying and dehydration as practical methods of preserving Magnolia figs, methods of preserving figs by frozen storage, and recipes for fig preserves, conserves, and paste.

Further experiments upon a new dietary essential present in proteins, W. C. Rose (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., pp. LXXIII, LXXIV*).—It is noted in abstract that blood proteins have been found to be much more abundant sources of the new dietary essential of proteins (E.S.R., 67, p. 339) than is casein. Fractions of fibrin have been prepared which in 1 percent concentration induce excellent growth when added to diets carrying mixtures of all known amino acids. The compound is considered to be unquestionably an amino acid and probably relatively simple in structure.

The effect on the toxicity of egg white of digestion with papain, H. T. Parsons, P. Janssen, and F. Schoenleber (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., p. LXVII*).—Partial digestion of fermented egg white with papain for a 4

to 7-day period did not decrease the toxicity appreciably, but tended to concentrate it in the filtrable digest rather than in the remaining undigested coagulum.

The extraction of the factor curative of dermatitis in rats due to egg white, J. G. Lease and H. T. Parsons (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., pp. L, LI*).—Attempts to obtain an extract of the curative factor for egg white dermatitis in rats (E.S.R., 71, p. 141) are summarized briefly. Some degree of success was obtained by boiling rich sources of the factor, such as cooked dried pork, kidney, or beef liver, with 5 or 10 percent HCl, followed by 60 percent ethyl alcohol, ether, butyl alcohol, or pyridine; or by digesting liver residue from extract No. 343 with papain, followed by extracting with water, 60 and 25 percent ethyl alcohol, 5 and 50 percent acetic acid, or 50 percent pyridine. Some activity was shown by the methyl alcohol and 95 percent ethyl alcohol extracts of the residue from an active water extract.

The digestibility of the protein of soybean milk, W. H. Adolph and Y. L. Wang (*Chinese Jour. Physiol., 8 (1934), No. 2, pp. 171–178*).—The relative digestibility of raw cow's milk and soybean milk obtained locally in Peiping, China, was determined by in vitro pepsin, trypsin, and pepsin followed by trypsin digestion experiments and in vivo coefficient of digestibility studies on rats.

The protein of soybean milk was found to be more rapidly hydrolyzed by pepsin than that of cow's milk, and the opposite was true of trypsin digestion. When acted upon consecutively by both enzymes, the protein in the cow's milk was digested more completely than the soybean protein. The optimum pH values for the enzymic proteolysis were almost identical for the two materials.

In the rat-feeding tests the coefficients of digestibility were 84.9 percent for the soybean milk protein and 86.6 percent for the cow's milk protein.

Sauerkraut juice for the acidification of evaporated milk in infant feeding, C. V. Rice (*Arch. Ped., 51 (1934), No. 6, pp. 390–395, figs. 4*).—Sauerkraut juice is recommended as a satisfactory substitute for lactic acid in acidifying evaporated milk for infant feeding. Among the advantages claimed for it are palatability, digestibility, economy, and simplicity of preparation and possible antiscorbutic and antirachitic properties, the latter because of the mineral content of the juice.

Study of the changes in basal metabolism produced by drinking chicory and chicory-coffee brews, M. Dye, S. S. McCosh, A. Marold, and C. Robinson (*Michigan Sta. Tech. Bul. 138 (1934), pp. 39, figs. 3*).—The purpose of this investigation was to determine (1) whether or not chicory alone, when used as a beverage, exerts any influence on basal metabolism and (2) whether the addition of chicory to coffee alters the effect of the latter on metabolism.

A brief discussion is given of the significance of basal metabolism determinations and a review of the literature on the effects of coffee and caffeine on metabolism. Data are then presented on the caffeine and caffetannic acid content of infusions of coffee, chicory, and chicory and coffee. The coffee infusion was prepared by stirring 10 g of ground coffee in 200 cc of water at 90° C. for 10 min. and then filtering the infusion through a triple layer of quantitative filter paper. A similar infusion was made of chicory and of a combination of 10 g of coffee and 1 g of chicory. The average caffeine content of the coffee infusion was 1.035 percent and of the chicory and coffee infusion 1.045 percent. The coffee infusion contained 7.31 percent of caffetannic acid, the chicory 8.72 percent, and the chicory and coffee 8.38 percent.

The metabolism experiments were conducted in two series, with a year intervening between the two. Different subjects were used in each series, 3 in the earlier and 4 in the later. One of the subjects was a girl 13 yr. old who had never tasted coffee, and the others were college students and research workers with varying habits of coffee drinking. All but one of the subjects were females. The coffee infusion used in the metabolism tests was made by adding 30 g of freshly ground coffee to 200 cc of water at a temperature of 90°, stirring constantly for 10 min., and filtering immediately. The other infusions were made in the same way, using 10 g of medium ground chicory in 200 cc of water, and 30 g of coffee plus 3.33 g of chicory in 222 cc of water, respectively. Water alone was also used.

Basal metabolism determinations were made in the morning after the usual half-hour rest, after which the beverage being studied was taken and the metabolism determined at half-hour or hour intervals for varying lengths of time. All of the liquids were at a temperature of from 50° to 60° when taken.

The drinking of 200 cc of water was found to have no effect on basal metabolism, and this was also true of the chicory infusion. A marked rise in metabolism followed the drinking of the coffee infusion. The time at which the maximum increase took place varied from test to test on the same subject and with the different subjects. The extent of the increase in metabolism also differed, but the average increase for all of the subjects was 6.7 percent. In the tests with the coffee-chicory infusion, there was no evidence of increased metabolism over the coffee infusion alone, the average increase being 6.8 percent.

Determinations of respiratory and pulse rates at the time of the metabolism tests showed no effect of the chicory infusion alone. In some, but not all, of the subjects there was evidence of slight increases in respiratory and pulse rates following the ingestion of the coffee and coffee-chicory infusions, but the changes were not consistent or permanent.

It is of interest that the subject who had never tasted coffee before showed no greater increase in metabolism after its ingestion than did 4 of the subjects who had been in the custom of drinking it.

A milk and banana diet for the treatment of obesity, G. A. Harrop (*Jour. Amer. Med. Assoc., 102 (1934), No. 24, pp. 2003–2005*).—Two methods of using bananas and milk as a reducing diet are described. In the first, 1 or 2 large ripe bananas with 1 glass of whole milk constitute the entire breakfast and lunch menus for an indefinite period. With this the evening meal is more or less restricted, consisting of clear soup, a slice of lean meat (or a serving of fish or fowl), 2 or 3 portions of 5 percent vegetables, a slice of bread and butter, and a portion of uncooked fruit. In the second method bananas and skim milk constitute the entire diet for a period of from 10 days to 2 weeks, alternating with a period of 2 weeks on a less restricted diet. During the banana period 6 large ripe bananas and 1,000 cc of skim milk should be taken daily in 2 or 3 meals. On this diet an adequate fluid intake is very essential and requires at least 6 glasses daily of fluid other than milk and without cream or sugar. The alternate diet includes the substitution of 1 or 2 eggs for 1 or 2 of the bananas and the use of from 1 to 4 servings of green vegetables and 1 portion of lean meat daily. No butter or other fat should be used in cooking, but a little may be added to the vegetables and eggs on serving.

The precautions to be taken in following this treatment and its general value and advantages are discussed.

A study of the relation of dietary fats to action of thyroid extract in rats, S. Loumos (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 8, pp. 895–898, figs. 6*).—Both growing and adult rats were fed the standard Steenbock diet

plus 100 mg of thyroid extract daily, and some of the animals were given in addition olive oil, coconut oil, or cod-liver oil in amounts of 3 cc per rat per day, with suitable adjustments to keep the calorie content of the experimental and control groups the same.

Olive oil at first inhibited and then hastened the action of the thyroid extract in both growing and adult animals. Coconut oil showed no preliminary inhibitory effect, but hastened the action of the thyroid from the first. Cod-liver oil had a marked protective effect.

The experiments were repeated with the exception that the oils were not added until after a marked decrease in weight had occurred. Under these circumstances the olive oil and coconut oil caused a rather sudden increase in the rate of loss in weight, and the cod-liver oil arrested loss in weight for about 10 days.

Preliminary results are also reported in similar tests of a cod-liver oil concentrate containing only a trace of iodine, 10,000 U.S.P. units of vitamin A, and 3,300 A.D.M.A. units of vitamin D in each daily dose. The results obtained were identical with those on plain cod-liver oil, indicating that the protection was due either to vitamin A or D or both.

Metabolism studies with rats suffering from fat deficiency, G. O. Burr and A. J. Beber (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 8, pp. 911, 912*).—This is a preliminary report of an extension of the studies of Wesson and Burr (E.S.R., 66, p. 390) on the respiratory quotients and metabolic rates of rats reared on the fat-deficient diet of Burr and Burr. The work has been continued over a period of 2 yr., using an open circuit apparatus with constant air stream and automatic sampling permitting the gas exchange to be followed over long periods of time. Rats reared on the stock diet and fat-deficient diet, and on the fat-deficient diet followed by cure through the use of certain fats, served as subjects during different combinations of starvation and feeding.

"The results show clearly that fat-deficient rats are very different from stock animals, and that fat-deficient rats which have been cured with small doses of fats return to a much more nearly normal gas exchange. The most marked differences shown by the fat-deficient rats are higher basal rate, higher specific dynamic action of food, and higher respiratory quotients. These results are of especial interest since the runs were made over long periods of time under normal conditions. The respiratory quotients of the fat-deficient rats remain above unity for as long as 12 hr. out of 24. They, therefore, synthesize every day large amounts of fat, but this synthetic fat does not prevent the fat deficiency."

High carbohydrate diets and insulin efficiency, H. P. Himsworth (*Brit. Med. Jour., No. 3836 (1934), pp. 57–60, figs. 2*).—The theory is advanced and supported by two illustrations from a wide range of experiments on healthy men and animals that "those dietetic conditions which bring about improvement of sugar tolerance are always associated with an increased susceptibility of the organism to insulin, while those which cause impairment of sugar tolerance are invariably accompanied by a decreased susceptibility."

The development of a heightened sensitivity to insulin under the stimulus of carbohydrate ingestion has also been demonstrated in some diabetics and serves to explain their improvement on a high carbohydrate diet. In the author's opinion this improvement "is to be ascribed not to the greater stimulation, and consequent overstrain, of their insulin-secreting tissue by the excessive intake of carbohydrate, but rather to the rendering of the diabetic more susceptible both to his pancreatic and the injected insulin. The result is that each unit of insulin available accounts for a greater amount of carbohydrate. This, neces-

sarily, by allowing a more economical utilization of the insulin secreted, reduces the demand of the body for insulin, with a consequent easing of the strain on the diseased islet cells. By thus lightening the burden on the cells which remain capable of function, it is possible that we aid their conservation as healthy tissue and save rather than squander the patient's own pancreatic resources."

Attention is called to the application of this theory in the treatment of diabetic coma by administering large doses of glucose in connection with insulin. An almost complete absence of the factor responsible for susceptibility to insulin is thought to account for the unusual resistance to insulin shown by some patients. It is also suggested that there may be a type of diabetes attributable not to diminished secretion of insulin by the pancreas but to a greater or less impairment of the organism's susceptibility to insulin.

Food sensitization and tolerance, M. A. Ramirez (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 4, pp. 286–291*).—In this discussion of the symptoms of and tests for food allergy, the author expresses his belief that elimination diets properly conducted and carefully observed are much more reliable than cutaneous tests in detecting food sensitiveness. In his opinion it is "most unwise to place a patient, particularly a child, on a restricted diet, eliminating essential foods, and basing the diet entirely on the result of skin tests. Such skin sensitization tests, with regard to foods, are quite unreliable in determining mucous membrane sensitivity."

Food intoxication and infection, F. W. Tanner (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 4, pp. 279–285*).—This is a general discussion of the different types of illness which may be caused by food, with emphasis on the responsibility of the dietitian in helping to prevent outbreaks of food intoxication and infection.

Nutrition as a factor in child development based on studies of children covering the entire period of growth, W. R. P. Emerson (*Arch. Ped., 51 (1934), No. 6, pp. 343–362, figs. 4*).—This general discussion of the essentials of good nutrition, the effects of malnutrition, and some of the errors in present-day health programs is based upon the author's extensive experience throughout the country in organizing clinical work in physical fitness among children of preschool and school ages (E.S.R., 69, p. 306).

Findings from residence service in infant nutrition, H. V. Monsch and D. McA. Maughan (*Natl. Res. Council, Child Develpmt. Abs. and Bibliog., 8 (1934), No. 2, pp. 153, 154*).—This is a brief summary of an analysis of records of feeding practices, birth weights, gains during the first year, and the extent of rickets and other nutritional disturbances among 298 of the 450 infants brought to the department of infant nutrition, New York State College of Home Economics, for consultation since 1919.

Food requirement of girls from six to thirteen years of age, M. Koehne and E. Morrell (*Amer. Jour. Diseases Children, 47 (1934), No. 3, pp. 548–558*).—Quantitative records of the food intake of 28 normal girls from 6 to 13 yr. of age on a uniform type of diet were collected for periods of time varying from 28 to 192 consecutive days and analyzed for the distribution of the essential food constituents.

The intake of calories per kilogram body weight decreased gradually from 75 to 80 for girls from 6 to 8 yr. of age and to between 55 and 60 for those 12 yr. of age. The average distribution of calories for the entire group was 14.3 percent from protein, 43.2 percent from fat, and 42.6 percent from carbohydrate, with individual variations from the average values not exceeding from 3 to 4 percent.

The intake of protein per kilogram body weight was between 2.5 and 3 g for the girls from 6 to 8 yr. old, with a gradual decrease to between 2.3 and 1.8 g for girls of 12 yr. The intake of calcium and phosphorus met the Sherman standards. The calculated values for iron were thought to be too high, making the actual intake below the recommendations of Rose et al. (E.S.R., 65, p. 290) and Leichsenring and Flor (E.S.R., 67, p. 475). The calculated acid-base values showed a ratio of 2 parts of available acid to 5 parts of available base.

Studies in the food requirement of adolescent girls.—IV, The mineral intake of 38 well-nourished girls 10 to 16 years of age, B. WAIT and L. J. ROBERTS (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 2, pp. 124–137*).—This paper, after reviewing the literature on mineral balance and intake studies, reports the individual intakes of the important mineral constituents of 38 of the adolescent girls whose energy and protein intakes were discussed in previous papers of the series (E.S.R., 69, p. 892). The average daily intakes of the entire group were approximately 1.1 g of calcium, 1.4 of phosphorus, 0.3 of magnesium, 2.8 of potassium, 0.9 g of sulfur, 11.9 mg of iron, 1.7 of copper, and 3.4 mg of manganese.

There were considerable individual differences in the total consumption of all of these minerals with the exception of calcium, which was less variable. Seventy-five percent of the Ca : P ratios fell within the range of 0.75 : 1–0.9 : 1. With the exception of sulfur and manganese, the mineral intakes varied quite closely with the caloric intake. There was a still closer relationship with protein intake, particularly in the case of sulfur, iron, and phosphorus. There was little or no correlation beween the total intake of any of these minerals and the age, weight, or height of the subjects, or between their per centimeter intake and age. There was a fair correlation between the intake per kilogram with age and with height. A table has been compiled of smoothed values for per kilogram intakes of the various minerals by age, and these are suggested as tentative minimum standards to be used until more data are available.

The basal metabolism of some American Indian girls, M. M. SHAW (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 2, pp. 120–123*).—Basal metabolism determinations on 4 full-blooded American Indian girls from 18 to 20 yr. of age in attendance at the United States Indian School at Flandreau, S.Dak., are compared with similar determinations on 5 white girl students from 19 to 22 yr. of age attending the University of South Dakota. The average values for the white and Indian girls, respectively, were total calories 1,431 and 1,452, calories per square meter per hour 37.15 and 38.61, and the calories per kilogram per 24 hr. 25.02 and 26.6. The deviations from various standards were Aub-DuBois −0.76 and 1, Harris-Benedict −0.68 and 4.9, and Dreyer −0.42 and 3.9.

Growth in height and weight of Texas school children, J. WHITACRE (*Texas Sta. Rpt. 1933, p. 113*).—This is a brief progress report on the investigation noted previously (E.S.R., 67, p. 771).

Selection of malnourished school children, R. FRANZEN (*Amer. Jour. Diseases Children, 47 (1934), No. 4, pp. 789–798*).—In an attempt to find a practical preliminary procedure for detecting malnutrition among children, 500 children 11 yr. of age were subjected to extensive anthropometric measurements, and from formulas derived in the course of the school health study of the American Child Health Association (E.S.R., 62, p. 687) extreme deviations in weight, amount of subcutaneous tissue, and amount of muscle were calculated. Four preliminary methods of selection were then compared for their efficacy in picking out these cases of extreme deviation. The methods were (1) weight

for height, (2) weight for height and width of hips, (3) the arm girth, chest depth, hip width screen of the author, commonly known as the A.C.H. screen, and (4) rating by medical examiners. The Baldwin-Wood tables were used to compute the percentage underweight, and the height-hip-weight indexes were computed by the use of regression equations obtained from a large random sample. The method of using the A.C.H. screen is explained by the reproduction of a score card. The ratings by the medical examiners were made on the Dunfermline scale, but on different material from the rest of the study, the data being obtained on 100 boys 11 yr. old.

The four methods were compared in turn with the true deviation in weight, the true muscular deviation, and the true deviation in subcutaneous tissue as criteria. In all cases the A.C.H. screen gave the best results. "When the three criteria are used in combination, the A.C.H. screen is far superior to the other methods of selection. It then nets 41 of 43 (as yielded by the intensive survey) under conditions of selection which choose only 1 of 4 for intensive measurement. This compares to 27 and 16 netted by the other two objective methods. Use of height-hip-weight devices are not adequate measures of weight or of malnutrition. Comparisons of weight alone, even when skeletal build is taken into account, omit many marked deviations in the soft tissues."

Inasmuch as the test has been applied as yet to only one age group, the adoption of this procedure in schools is not recommended until after similar studies have been made of the other age groups from 7 to 12, inclusive.

Foods of a Hindu village of north India, C. V. Wiser and H. Monsch (*Natl. Res. Council, Child Develpmt. Abs. and Bibliog., 8 (1934), No. 2, pp. 158, 159*).—A brief description is given of a survey of food habits in a village of northern India, including the general findings in the analysis of detailed food consumption records for four families of different caste during one week each of the hot and cold seasons. The diets were considered to be sufficient in calories and protein (although the quality of the protein was doubtful), but markedly deficient in calcium and vitamins A, C, and G.

Dietary habits during pregnancy, C. M. Coons (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 2, pp. 95–106.*)—The dietary studies presented in this contribution from the Oklahoma Experiment Station are for 15 women during a total of 48 observation periods covering 212 days of pregnancy, and include case histories and data on protein, fat, carbohydrate, and calories, together with figures for calcium, phosphorus, magnesium, and iron from previous reports (E.S.R., 63, p. 490; 68, p. 412). The subjects, 8 of whom were studied in Chicago in 1927–29 and 6 in Oklahoma in 1931–32, include 8 in the first, 4 in the second, and 1 each in the third and fourth pregnancies. The general findings are summarized as follows:

"Irregularities in choice of food were shown by the same individual from time to time during a given gestation, and wide variations in dietary habits were exhibited by women living under similar conditions of climate, household activities, and other environmental factors.

"The means for the 24-hr. food consumption in all diets were as follows: Total calories 2,497, protein 70 g, fat 103 g, carbohydrate 336 g, calcium 1.247 g, phosphorus 1.527 g, magnesium 0.384 g, and iron 15.22 mg. The mean intake per kilogram of pregravid body weight was calories 44, protein 1.2 g, fat 1.8 g, carbohydrate 5.5 g, calcium 0.020 g, phosphorus 0.025 g, magnesium 6.2 mg, and iron 0.27 mg each daily. Less variable results were obtained when predicted nonpregnant weight instead of actual weight was used, and the means were the same for either method."

The acid-base balance of the minerals retained during human pregnancy, C. M. and R. R. Coons and A. T. Schiefelbusch (*Jour. Biol. Chem., 104 (1934), No. 3, pp. 757–768*).—This paper reports as another phase of the above-noted extensive investigation at the Oklahoma Experiment Station of the dietary habits of pregnancy 20 records of acid-base balance on five of the pregnant subjects. Aliquot samples of food, drinking water, and urine and all of the feces for 4-day metabolism periods were collected, composited, and analyzed. The data are reported in daily average retentions in grams of the acid-forming elements chlorine, sulfur, and phosphorus and the base-forming elements calcium, magnesium, sodium, and potassium and in daily averages of total base retained in terms of N/10 alkali.

The chlorine intakes were low, ranging from 4 to 9.68 g, with a mean of 5.82 g Cl daily. The retentions showed wide variations, ranging from −0.23 to 2.16 g of Cl daily, with a mean of 0.89±0.1 g. The variations were not related to any period of pregnancy. A negative or low chlorine balance was associated frequently with a high phosphorus balance and vice versa.

Eleven of the 20 sulfur balances were negative, although both positive and negative balances were small. Positive retentions did not appear to depend upon high total intakes of sulfur, although more storage did occur on diets containing large proportions of eggs and milk. It is thought that the metabolism of sulfur and factors influencing it during pregnancy should receive further study.

Phosphorus retentions ranged from 0.02 to 0.78 g, with an average of 0.3±0.03 g daily. The Ca:P retention ratios were unusually high, although the intake ratios were not particularly high.

The calcium and magnesium balances were all positive. The calcium retention ranged from 0.06 to 0.49 g daily, with a mean of 0.28±0.02 g. Corresponding figures for magnesium were 0 to 0.16 g, with an average of 0.06±0.005 g. It is noted that these values are higher than any hitherto published and considerably higher than the average daily deposits of these two elements in the fetuses, as reported by Givens and Macy (E.S.R., 70, p. 870). The best calcium retention occurred on diets affording a potential alkalinity of more than 1,000 cc of N/10 fixed base daily and the poorest on diets containing 800 cc or less of N/10 base. "However, not all diets supplying a potential alkalinity of more than 1,000 cc of N/10 base in excess of acid daily gave optimal storage, implying that factors other than the acid-base balance of the diets were important to Ca retention."

The average retention of sodium was 1.26±0.07 g daily and of potassium 0.51±0.03 g.

All of the diets supplied an excess of base-forming elements varying from 561 to 1,422 cc of N/10 base daily, with a mean of 1,037±36 cc. "The mean daily retentions with probable error were acid-forming elements 427±27 cc, base-forming elements 859±39 cc, and excess of base 436±28 cc. All diets were potentially alkaline, providing 561–1,422 cc, mean 1,037±36 cc of N/10 excess base daily."

The relative quantities of acid and base in the urine were more variable than in the food or feces. "In other words, the urine, by regulating losses of electrolytes, served to stabilize the retention against the variations of diet, digestion, and metabolic demand." The preponderance of fixed bases in certain urines was not paralleled by the findings for titratable acidity, free ammonia, and H-ion concentration, which were the highest in one subject whose diet was among the most potentially alkaline of any of the group.

One suggested explanation of this is that appreciable quantities of organic acids were being excreted either from fruits or vegetables. The need is emphasized of more studies on the metabolism of various organic acids found in food materials and the fate of these under different physiological conditions.

Relation of ingestion of milk to calcium metabolism in children, A. L. Daniels, M. K. Hutton, E. Knott, G. Everson, and O. Wright (*Amer. Jour. Diseases Children, 47 (1934), No. 3, pp. 499–512*).—This report of an extensive investigation of the metabolism of calcium, phosphorus, and nitrogen in 10 children between 3 and 5 yr. of age on diets differing chiefly in their calcium content as furnished by 1 pt. and 1 qt. of milk, respectively, challenges the generally accepted rule of a quart of milk a day for every child by showing that the amounts of calcium and phosphorus retained depend upon the physiological condition of the children and their potentialities for growth at the time of the study.

Although wide variations were found to exist in the amounts of calcium and phosphorus retained by the different children and by the same children under varying conditions of diet and of vitamin D (cod-liver oil, viosterol, or sunshine), these could be traced quite definitely to the condition of the children at the beginning of the experiment. Those who were poorly nourished at the beginning retained more calcium and phosphorus than the well-nourished children, and more in the early than the later tests after they had presumably acquired more of a reserve of these elements.

The children who were considered normal retained from 3 to 10 mg of calcium, from 6 to 8 mg of phosphorus, and from 34 to 90 mg of nitrogen per kilogram of body weight. On the diet used, which supplied approximately 23 percent of the total calcium from other sources than milk, the retention was as good on 1 pt. as on 1 qt. of milk.

The authors suggest that the high retentions reported in previous investigations, notably that of Sherman and Hawley (E.S.R., 48, p. 463), may have been due to the fact that the children under observation were more or less depleted in the substances studied.

"The amount of calcium that a child retains at any given time would seem to be a measure of his physiologic needs at that particular moment, provided enough is available. Single studies cannot determine how much calcium a child of a given age should retain. Balance studies should be made with the same children over a considerable length of time until one can be reasonably sure that they are physiologically full. It seems probable that diets which seemingly have resulted in low retentions have done so, not necessarily because the diets were too low in the given constituent, but because the child being studied needed less and therefore took from the amount offered only what he needed."

Calcium absorption in white mice, A. R. Bliss, Jr., and R. W. Morrison (*Jour. Tenn. Acad. Sci., 9 (1934), No. 3, pp. 232–241*).—The authors discuss briefly factors affecting the metabolism of calcium, and present data on the relative absorption of various calcium salts by mice, as determined by the amount of magnesium sulfate required to produce narcosis when injected subcutaneously 2 hr. after the administration by stomach tube of the product being tested in amounts equivalent to 0.3 g Ca per gram body weight. The calcium compounds studied, in decreasing order of efficiency, were calcium lactophosphogluconate, calcium lactate, calcium gluconate, calcium chloride, inosite hexacalcium gluconate, calcium diphosphate, and calcium glycerophosphate.

Calcium and phosphorus metabolism of rats on omnivorous and vegetarian diets, S. WAN (*Chinese Jour. Physiol., 8 (1934), No. 2, pp. 179–188*).—In order to obtain further information on the utilization of calcium and phosphorus by rats on omnivorous and vegetarian diets (E.S.R., 71, p. 130), a study was made of the calcium and phosphorus metabolism on one omnivorous diet and on two vegetarian diets supplemented with fresh vegetables, calcium carbonate, calcium phosphate, apatite, and calcium lactate, respectively. Five young rats were used in each series, which consisted of two experimental periods of 7 days each. For two of the diets two series of experiments were run and for the others one. The data obtained were treated statistically.

In spite of the fact that the calcium intake of the rats on the omnivorous diet was lower than on the vegetarian diets, the former retained more calcium both in absolute amounts and relative to body weight. The retention on the omnivorous diet amounted to 2 mg per 100 g body weight per day more than on the vegetarian diet giving the best results. The retention was higher in the group receiving calcium from vegetable sources than in any of the groups receiving calcium salts. In these groups a large proportion of the calcium was found in the feces. The omnivorous rats also retained more phosphorus than any of the vegetarian rats, and among the latter those receiving the element entirely from vegetable sources showed the highest retention. This is thought to demonstrate the superiority of fresh vegetables over inorganic salts as a source of calcium and phosphorus.

Studies on the requirements of calcium and phosphorus for gestation and lactation, W. M. COX, JR., and M. IMBODEN (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., pp. XVIII, XIX*).—In this preliminary report on the value of different Ca : P ratios in the diets of female rats through gestation and lactation, ratios of from 1:1 to 1.5:1 were found to give maximum performance as determined by the average weight of the young at 21 days, change in weight of the mother during the cycle, and ash content of the young. The ability of the nursing mother to change unfavorable ratios to more favorable was shown by blood and ash analyses of the young raised by such mothers.

The relation of copper to tissue respiration, C. A. ELVEHJEM, E. COHEN, and F. J. STARE (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., pp. XXV, XXVI*).—In this preliminary report of a continuation of studies on the action of copper in the animal body (E.S.R., 70, p. 872), a summary is given of the changes observed in the oxidative mechanisms in the tissues of rats during the development and treatment of anemia. Slightly reduced rates of oxygen consumption were observed in the tissues of severely anemic animals. The *a*-component of cytochrome was greatly reduced or absent in the tissues of the anemic rats, and the activity of certain dehydrogenases was also reduced. Both of these were restored to normal by the addition of copper alone to the diet, but iron was without effect.

Studies in the nutritional anemia of the rat.—X, Hemoglobin production and iron and copper metabolism with milk of low copper content, F. C. BING, E. M. SAURWEIN, and V. C. MYERS (*Jour. Biol. Chem., 105 (1934), No. 2, pp. 343–354*).—This continuation of the series of papers noted previously (E.S.R., 71, p. 284) has been essentially noted from a preliminary report (E.S.R., 71, p. 570).

Pyruvic acid and the avitaminous brain, R. A. PETERS and R. H. S. THOMPSON (*Jour. Physiol., 81 (1934), No. 2, p. 22P*).—In this preliminary report evidence is summarized briefly in support of the view that pyruvic acid is a normal tissue metabolite.

Vitamins A and D: Their relation to growth and resistance to disease, R. SUTHERLAND (*Brit. Med. Jour., No. 3826 (1934), pp. 791–795*).—A dietary survey (E.S.R., 64, p. 286) having shown that the diets of many families of the poorest classes in various towns and cities in Scotland were grossly inadequate in several respects, including in all probability vitamins A and D, a concentrate of these two vitamins was administered to 294 school children of the lower working classes in one of the towns included in the survey in daily doses equivalent in vitamin A to rather more than 1 oz. of high-grade cod-liver oil. A similar group of 281 children served as controls. The possible beneficial effects of the concentrate were studied by comparisons of the two groups with respect to growth in height and weight, nutritional condition, records of illnesses, and susceptibility and resistance to colds during the 6 mo. of treatment from November 9, 1931, to May 15, 1932.

The children in the treated group gained an average of 8 percent more in height and 7 percent more in weight than the control group, and their nutritional records were slightly better. Statistical analysis of the data by J. O. Irwin showed that the balance in favor of the treated group was significant for height in the males, but not females, and not significant for weight for either sex.

No definite evidence was found of the value of the vitamin supplement in the prophylaxis or treatment of abnormal conditions of the tonsils, lymphatic glands, nose, eyes, and skin, and the treated group actually averaged 1½ more days of illness than the controls. No significant differences were found with respect to the incidence of the common cold.

In an effort to explain the negative results of this experiment, the nutritive values of the diets of 66 of the families were compared with that of a similar survey in the same locality in 1927 (E.S.R., 64, p. 286) and with the British Medical Association standards for calories, protein, carbohydrate, and fat (E.S.R., 70, p. 718) and the McLester standard for minerals (E.S.R., 59, p. 187). While the estimated per capita food consumption in 1927 fell below the standards only in fat, the averages in 1932 were below the standard in every item. Not only was this true of the general averages, but of very high percentages of the individual families—82 percent for protein, 80 for carbohydrate, 94 for fat, 68 for calcium, 80 for phosphorus, and 86 percent for iron.

A further comparison was made of the increases in height and weight of the children in the 1927 and 1928 school milk feeding experiments conducted by Orr and his associates (E.S.R., 60, p. 192) with those of the present study. In the two milk studies the percentage increases in height and weight of the experimental group over the control group ranged from 21 to 45 percent, whi[le] in the vitamin experiment the increase in height was only 8 and in weight [7] percent over the controls.

These comparisons are thought to show that milk supplements succeede[d] where vitamin supplements failed, largely because in addition to correcting t[he] vitamin deficiencies they made good other deficiencies of the inadequate diets.

"On biological grounds, then, there can be no comparison between the val[ue] of milk and that of vitamin concentrates as supplements to a defective bas[ic] diet. To this there is added the potent economic argument that not only do[es] milk produce better results than vitamin concentrates, but it does so at [a] greater cost. The time has come when the public must be educated to real[ize] that vitamin supplements do not constitute a nutritional short cut to heal[th]. A vitamin concentrate can correct only a vitamin deficiency. It has no ma[gic] power of assuming the functions and properties of other essential factors [of] the diet. The metabolism of food in the body is a chemical process, and

this process is to proceed to the best advantage, the correct constituents must be present in sufficient quantity and they must be present in approximately correct proportions."

Potency of vitamin A and vitamin D of halibut liver oil, correlated with seasonal variations in the oil content of halibut liver, C. E. BILLS, M. IMBODEN, and J. C. WALLENMEYER (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., p. X*).—In this preliminary report it is noted that the potency of halibut liver oil in both vitamins A and D varies inversely with the oil content of the liver, although vitamin A fluctuates more widely than vitamin D. As an illustration, January and August values are given as follows: Content of the oil 12 and 25 percent, vitamin A potency 240,000 and 35,000 international units per gram, and vitamin D potency 1,400 and 900 international units per gram, respectively. It is also noted that studies on tuna fish liver have shown an exceptionally low oil content of 4 percent, with a remarkably high vitamin D value of 7,500 international units per gram.

Vitamin tests on California and Asiatic dates, A. F. MORGAN (*Jour. Home Econ., 25 (1933), No. 7, pp. 603–611*).—In this study, in which the author had the assistance of F. Gillum, pasteurized and unpasteurized Asiatic Hallawi dates were tested for vitamins A and D, the pasteurized for vitamin C, and locally purchased pasteurized (Dromedary) for vitamin A. Three samples of California-grown Hallawi dates, all tree ripened, 1 not fumigated, 1 fumigated with carbon disulfide, and 1 fumigated and commercially washed, were tested for vitamins A and D. Three samples of California-grown Deglet Noor dates, tree ripened, tree ripened and fumigated, and artificially matured, were tested for vitamins A and D.

The vitamin A content of the Asiatic Hallawi dates was about the same for the three samples (about 300 international units per pound as usually marketed), although the pasteurized samples contained slightly less than the unpasteurized. The California-grown Hallawi samples had about the same vitamin A value as the Asiatic except the commercially washed sample, which was of definitely lower vitamin A content, about 186 international units per pound. The vitamin A content of the artificially matured sample of California-grown Deglet Noor dates, 338 international units per pound, was somewhat higher than the corresponding sample of Hallawi, and definitely higher than values reported by Smith and Meeker (E.S.R., 66, p. 391) for artificially matured Arizona Deglet Noors. No deterioration was noted as a result of either the maturation or fumigation process.

No vitamin C could be detected in the samples tested. The Hallawi varieties, both Asiatic and California grown, showed "slight but probably real" vitamin D value, and the 1 sample of Deglet Noor examined "slight, if any", vitamin D.

Canned strained vegetables as sources of vitamin A, F. HANNING (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 4, pp. 295–305, fig. 1*).—Studies are reported on the vitamin A content, as determined by the technic of Dye, Medlock, and Crist (E.S.R., 57, p. 895), of a number of canned strained vegetables of a single brand. As compared with published values for the same vegetables, raw and canned, the concentrations of vitamin A in the different products were of the same order with the exception of the canned strained peas, which had a lower value than reported in the literature. However, canned peas prepared from the same lot as the canned strained product did not have a higher vitamin A value than the strained product. Although unit values were not definitely established, some indication of the concentration of vitamin A in the various products is shown by the following data:

The smallest quantity of canned strained spinach fed, 20 mg, brought about a weekly gain in weight of 3.96 g, or slightly more than unit growth. Of strained carrots, 40 mg gave more and 30 mg less than unit growth. Of strained tomatoes, 50 mg, equivalent to 133 mg of the raw tomato, gave more than unit growth. Of the strained peas, 150 mg gave somewhat less than unit growth, and of green beans 250 mg, equivalent to 160 mg of the fresh beans, approximately unit growth. Of the mixed vegetables, 150 mg induced more than unit growth.

The distribution of vitamin A in the tissues of the rat and of the guinea pig, S. W. Clausen and A. B. McCoord (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., pp. XV, XVI*).—This is a brief summary of a comparison of the ability of the rat and the guinea pig to store vitamin A and synthesize it from carotene. When a massive dose of haliver oil was given to a rat and its organs were examined 24 hr. later, 71 percent of the vitamin was found in the liver, and the adrenals and lungs also showed a greatly increased content. In similar experiments on the guinea pig, only 6 percent of the vitamin A administered could be extracted from the liver and none from the adrenals. The guinea pig also seems incapable of synthesizing vitamin A from ingested carotene, for after feeding 1 mg of carotene in the form of caritol daily for 2 weeks no increase in the vitamin A content of the liver or adrenals was observed.

Vitamin 'A' and carotene: A review, E. N. Todhunter (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 3, pp. 173–187*).—This review of recent literature includes a bibliography of 95 references.

The rôle of carotene in human health, A. F. O. Germann (*Jour. Chem. Ed., 11 (1934), No. 1, pp. 13–16*).—This review and discussion is of interest chiefly from the questions it raises concerning the relationship of carotene to vitamin A (which the author proposes to call the hormone vitin) and the function of carotene in the animal body.

On the absorption and utilization of β-carotene in jaundiced and in choledochocolostomized vitamin A-deficient rats, J. D. Greaves and C. L. A. Schmidt (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., pp. XXXI, XXXII*).—In this preliminary report on a continuation of the studies on the role of bile in the absorption and utilization of fat-soluble vitamins (E.S.R., 70, p. 883), evidence from three types of experiments is summarized, pointing to the necessity of bile for the absorption of β-carotene from the rat's intestines.

The sparing action of fat on vitamin B, H. M. Evans and S. Lepkovsky (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., p. XXVII*).—Evidence is summarized briefly leading to the conclusion that the sparing action of fat for vitamin B, as shown in rat feeding experiments, is due to the conservation of vitamin B in the rat's body rather than to the intervention of fat in the rat's metabolism, delaying the development of the avitaminosis.

Animal response to crystalline vitamin B_1, R. E. Waterman and M. Ammerman (*Jour. Biol. Chem., 105 (1934), No. 2, Proc., p. XCVIII*).—The physiological effects of crystalline vitamin B prepared as described by Williams and Eddy (E.S.R., 71, p. 298) on rats and pigeons are summarized briefly. A single injection of 5γ cured polyneuritic rats for from 4 to 7 days, and larger doses up to 50γ prolonged the cures. Pigeons were cured by 4γ doses administered by mouth. Increasing doses of the crystals of from 2 to 40γ fed daily to rates depleted of vitamin B caused increased growth rates. Pigeons depleted on autoclaved wheat likewise showed increasing weights with increased dosage of the crystals, beginning with 5γ daily and increasing to 160γ.

Effect of carbon dioxide and sodium benzoate on vitamin C content of orange juice, A. F. Morgan, C. I. Langston, and A. Field (*Indus. and Engin. Chem., 25 (1933), No. 10, pp. 1174–1176*).—Two samples each of California

valencia and navel orange juices kept in frozen storage for from 8 to 18 mo. showed no loss in vitamin C, affording full protection to standard guinea pigs for 60 days in doses of from 0.15 to 2 cc daily. No difference could be detected in the vitamin C content of the juice from the two types of orange.

A sweetened commercial orange sirup similar to a number of preparations on the market was prepared, with and without 0.1 percent sodium benzoate, and tested for vitamin C in doses of 3, 4, and 5 cc daily for the usual period. The smallest dose of either form afforded as much protection as did 2 cc of fresh or frozen whole orange juice. The apparent diminution of the vitamin C content is attributed to the dilution of the juice by the added sugar in the preparation of the sirup, but no destruction by the sodium benzoate was apparent.

The same sirup, without the sodium benzoate, bottled with carbonated water at 2.5 kg per square centimeter pressure was likewise found to retain its full vitamin C content, as 6 or 7 cc proved equivalent to 1 cc of the freshly extracted orange juice without dilution. A similar preparation containing no excess carbon dioxide had a much lower content of vitamin C.

Symptoms of viosterol overdosage in human subjects, C. I. Reed (*Jour. Amer. Med. Assoc., 102 (1934), No. 21, pp. 1745–1748*).—This report amplifies an earlier discussion by Rappaport and Reed (E.S.R., 70, p. 284). Of a total of 300 human subjects ranging in age from 7 to 72 yr. and receiving doses of viosterol of from 3,000 to 2,760,000 international units of vitamin D daily, or a maximum of 920 times the normal antirachitic dose of 3,000 international units, 43 patients showed symptoms of toxicity in varying degree.

Increased frequency of urination is said to be the most common initial symptom of incipient toxicity. At about the same time or shortly after there is loss of appetite, with persistent nausea, generally followed by vomiting and diarrhea. If the dosage is continued there is a loss of weight, probably accompanied by increased metabolic rate and increased urinary excretion of nitrogen. Other symptoms are as noted in the preliminary report. A few instances of a disturbance in the regularity of menstruation and several cases of severe constipation are also noted. There has been no evidence in the author's experience of increased blood pressure or calcification of the tissues.

"It would appear, then, that there need be little apprehension about the administration of amounts ranging up to 150,000 international units daily for indefinite periods. Larger amounts had better be limited to periods of a few months at most, depending on the therapeutic effects desired."

Cod liver oil sensitivity in children, R. M. Balyeat and R. Bowen (*Amer. Jour. Diseases Children, 47 (1934), No. 3, pp. 529–532, fig. 1*).—For children who show definite allergy to cod-liver oil, the authors recommend carotene fortified with vitamin D on the basis of success in its use in their clinical experience. Four case reports are given in illustration.

Observations on vitamin treatment of reproductive abnormalities in the rabbit, C. K. Hu, P. D. Rosahn, and H. S. N. Greene (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 8, pp. 1010–1012*).—The materials used for the vitamin treatment employed in an effort to overcome infertility in male and female rabbits consisted of halibut-liver oil alone in one case, and in all others of dried brewer's yeast, either alone or in combination with halibut-liver oil or viosterol, or both. The periods during which the vitamins were administered (amounts not stated) varied from 4 days to 2½ mo., most of the animals being treated for a little over a month.

Of a group of 38 does and 4 bucks selected for abnormal reproductive behavior, 19 does and all 4 bucks had failed to reproduce upon repeated matings,

13 does deserted their young or made no attempt to nest or raise them, and 6 destroyed their young at birth or within a few days. Of the 19 persistently infertile does, 9 became pregnant after the vitamin treatment, although in some several matings were required. Of the 4 infertile bucks, 3 became fertile after vitamin treatment. There was some degree of improvement in the behavior of the does grouped under desertion or neglect of young and in 3 of the 6 grouped under cannibalism.

The cholesterol content and the antirachitic activation of milk constituents, S. Ansbacher and G. C. Supplee (*Jour. Biol. Chem., 105 (1934), No. 2, pp. 391–404*).—Using a new method, which is described in detail, the authors have determined the distribution of cholesterol in the various constituents of milk, with the following results expressed in milligrams per 100 cc of fluid milk: Whole milk 11.83 mg, butterfat 9.75, skim milk 2.16, casein 0.84, whey 1.37, lactalbumin 0.9, serum without lactalbumin 0.5, heat-precipitable matter other than lactalbumin 0.3 mg, and serum without protein and phosphates traces.

The cholesterol associated with the lactalbumin is thought to be of special interest in that in percentage of total cholesterol (7.61 percent) and of the dry fraction (180 mg percent) the values were higher and more constant than for any other constituent except the fat.

Butter oil treated in various ways, such as filtering, washing, bleaching, etc., was irradiated and tested for vitamin D by the line test, as were also samples of insoluble and peptized lactalbumin. Cholesterol determinations were also made of the treated butter oils. The oxidation of the butter oil by heat in the presence of air lowered the cholesterol content and diminished the antirachitic activity on subsequent irradiation. The lactalbumin showed substantial vitamin D potency on irradiation.

The findings are thought to suggest that the greater clinical effectiveness of irradiated milk as compared with other antirachitic reagents may be due to the prosthetically bound fatty matter of the milk protein which is capable of activation on irradiation.

Potency of milks fortified with respect to antirachitic properties: Clinical tests and a proposed method of procedure, M. M. Eliot and G. F. Powers (*Jour. Amer. Med. Assoc., 102 (1934), No. 22, pp. 1823, 1824*).—A standard clinical procedure for the appraisal of milks fortified with respect to their antirachitic properties is described in detail. Although the original paper should be read by anyone undertaking to follow the method, some of the points of interest in it are as follows:

The test is preventive rather than curative. The subjects should include both normal and premature infants, at least half of whom should belong to races especially susceptible to rickets, e.g., Italian and negro. They should be not over 8 weeks of age at the beginning of the test, and the experiments should continue for at least 6 mo. The tests should be conducted in the North Temperate Zone, preferably from October to May, and on enough subjects so that at least 50 continue through the entire experimental period. The effectiveness of the milk is to be judged by the results of roentgenographic examination of the wrists and forearms of the subjects at intervals of 4 weeks according to a uniform standardized technic. Special directions are given for the type of feeding.

"Each study should be carried out under the direction of an experienced pediatrician with such other assistants as may be required. This director must be able not only to correlate and appraise data, but also to inspire assistants and mothers with enthusiastic and intelligent interest. Only in this way can a degree of accuracy be achieved which, while not comparable to

that of many laboratory biologic tests, is nevertheless acceptable from a clinical standpoint in the light of our present knowledge."

Prevention of rickets by milk fortified with vitamin D from cod liver oil (150 Steenbock units of vitamin D per quart), W. R. WILSON (*Jour. Amer. Med. Assoc., 102 (1934), No. 22, pp. 1824–1831, figs. 2*).—In this appraisal of the antirachitic value of milk fortified with the Zucker cod-liver oil concentrate (E.S.R., 69, p. 154) to the extent of furnishing 150 Steenbock vitamin D units per quart, the method noted above was followed in every detail, with results leading to the following conclusions.

"Since the amount of vitamin D necessary to prevent rickets is probably dependent to a great extent on rate of growth, and since the growth of young infants does not necessarily conform to the amount of milk consumed daily, it is clear that infants who gain rapidly on relatively small amounts of milk will not receive an adequate amount of vitamin D from a fortified milk unless the amount of vitamin incorporated per quart is such that protection will be afforded when considerably less than a quart is consumed. If, therefore, milk is to be relied on for the sole supply of vitamin D during the period of most rapid growth, it would appear that the minimum amount likely to be consumed during the first 4 mo. of life—approximately a pint—should contain an amount of vitamin D adequate to protect the normal rapidly growing infant. It would appear from the data here presented that the addition to 1 qt. of milk of 150 Steenbock units of the vitamin D concentrate used did not furnish enough vitamin D to prevent the development of a moderate degree of rickets *in 2 out of the 33 infants studied. How many units of this vitamin D concen*trate per quart would be required to protect completely all normal infants can be determined only by further study."

Beriberi following drastic voluntary dietary restriction, D. RIESMAN and H. S. DAVIDSON (*Jour. Amer. Med. Assoc., 102 (1934), No. 24, pp. 2000–2003*).—Two case reports from the authors' experience and several from the literature are given to illustrate the occurrence of beriberi as a result of voluntary diet restriction and its prompt cure after correction of the faulty dietary habits.

Dental caries.—III, Rickets in relation to caries in the deciduous and in the permanent teeth, A. F. HESS, H. ABRAMSON, and J. M. LEWIS (*Amer. Jour. Diseases Children, 47 (1934), No. 3, pp. 477–487, figs. 2*).—Evidence is presented and discussed leading to the conclusion that "caries of the permanent teeth is not due to infantile rickets but to a nutritional disturbance occurring in childhood and early adult life."

The first line of evidence was a comparison of the extent of caries in the deciduous and permanent molars of a group of children from 6 to 7 and 7 to 9 yr. of age, some of whom had been protected against rickets and others not. It was found that the percentage of carious deciduous molars was much higher in the children who had had rickets, but that the incidence of caries was approximately the same in the permanent molars of both groups.

Further evidence included a comparison of the incidence of caries of the permanent molars among a group of white and negro children. Although most of the negro children had had rickets, the incidence of caries was considerably less among them than among the white children. It was further shown that the extent of caries in the deciduous teeth of children in the institution with which the authors were connected increased in proportion to the age of the children when admitted to the institution where there was excellent dietary protection against rickets. Attention was finally called to the results of an extensive X-ray examination of the teeth of the children in the same institution. This showed that the permanent molars do not undergo calcification

until the child is 3½ or 4 yr. of age, or considerably later than the usual onset of rickets.

In discussing these findings, the authors express the opinion that the term calcifying vitamin is better than antirachitic vitamin in describing the function of vitamin D, and emphasize the importance of providing this vitamin in the diet throughout childhood and early adult life in order to afford full protection to the teeth. "Calcium and phosphorus should be provided so that the vitamin may function properly. In fact, this is one of the main reasons why we favor the extended use of irradiated milk throughout childhood and early adult life. This point of view in regard to the calcification of the teeth and the role of calcifying agents would seem to account for many apparent divergences which are to be found in the voluminous literature on the relation of rickets to dental caries."

The histologic changes in the enamel and dentin of the rat incisor in acute and chronic experimental fluorosis, I. Schour and M. C. Smith (*Arizona Sta. Tech. Bul. 52 (1934), pp. 69–91, pls. 20*).—This report makes a further contribution to the problem of mottled teeth (E.S.R., 70, p. 887) in demonstrating, through photographs, radiographs, and microphotographs of the teeth of rats in which chronic and acute fluorosis had been produced by the feeding and injection of sodium fluoride, that "fluorine exerts a direct local action on the enamel-forming cells and that the changes observed in the enamel and dentin are not produced primarily by changes in blood calcium and phosphorus or by disturbances in the parathyroids."

The histologic changes in acute fluorosis obtained by single or multiple injections are described in detail and summarized as follows:

"Both the enamel and dentin show a pair of light (disturbed) and dark (recovery) incremental layers for each injection of sodium fluoride. The width of each pair is approximately 32μ for injections given 48 hr. apart and approximately 16μ for injections given 24 hr. apart. The light layers represent the immediate response to the injections and are imperfect in formation and in calcification. The dark layers represent a recovery response to the injections and are normal in formation and normal or excessive in calcification. This incremental pattern is a constant finding with the exception of single injection experiments of 24 hr. or less of post-operative life. Disturbances of this pattern arise when the dosage is increased or when the administration is continued for more than five injections at 24-hr. intervals."

The injection of fluorine is thought to offer possibilities in dental research, particularly in measuring the rate of growth of enamel and dentin.

Diet in diabetes mellitus, A. Marble (*Jour. Amer. Dietet. Assoc., 9 (1933), No. 3, pp. 199–206*).—This general discussion includes the history of the dietetic treatment of diabetes, several diets in common use at the present time, and the principles governing a satisfactory diet.

Myasthenia gravis: The effect of treatment with glycine and ephedrine; third report, W. M. Boothby (*Arch. Int. Med., 53 (1934), No. 1, pp. 39–45*).—This paper reviews briefly the literature on the treatment of myasthenia gravis with glycine and ephedrine, alone and combined, and gives case reports of 12 patients under observation at the Mayo clinic during the past year. The disease is of nutritional interest because of the benefits accruing from treatment with glycine.

"Glycine is one of the simpler amino acids and, therefore, is one of the constituents of most proteins, including muscle protein. Since our bodies have, under normal conditions, the ability to synthesize this substance, it is probable that the substance is exceedingly important for many different purposes. Just

how it is beneficial in myasthenia gravis is not known. Neither is it known why or how ephedrine produces a beneficial effect."

Energy expenditure in walking and running, M. Ogasawara (*Jour. Physiol., 81 (1934), No. 2, pp. 255–264, figs. 2*).—A comparison of the oxygen requirement per minute, as determined by the Douglas-Haldane method, when walking and running at the same speeds showed that with increasing speed the oxygen requirement for walking increases at a greater rate than for running. The increased requirement for walking over running amounted to 4 percent at a speed of 121.1 m per minute, 15 percent at 151.5, and 20 percent at 172.4 m per minute. In walking at high speeds the requirement was less when light rubber shoes were worn than with leather walking shoes.

Inasmuch as the oxygen requirement per stride was found to be substantially the same when walking or running, it is thought that "the increased oxygen requirement for walking is essentially due to the fact that more muscular movements are necessary because the length of stride is less."

TEXTILES AND CLOTHING

[Textile research in Texas], M. A. Grimes (*Texas Sta. Rpt. 1933, pp. 110, 111*).—Brief progress reports are made on studies of the effect of Texas sunlight on the durability and color of cotton fabrics and of the effect of exposure in the field on the color and related physical factors of raw cotton fibers.

Unit cell of cellulose in cotton stalks and cusps, J. P. Sanders and F. K. Cameron (*Indus. and Engin. Chem., 25 (1933), No. 12, pp. 1371–1373*).—Cellulose of cotton stalks and cotton cusps was shown in studies at the University of North Carolina to be the same as that found in cotton lint, spruce, pine, and poplar. The unit cell or fundamental structure is the same irrespective of the origin of the cellulose. Differences in physical properties of products from celluloses of different origins were indicated by X-ray and chemical methods to be due to differences in micelle or fibroid structures.

A comparison of the fading produced by the Fade-ometer (type LV) and by sunlight, M. E. Griffith, W. R. Brode, and H. Robertson (*Ohio Sta. Bimo. Bul. 169 (1934), pp. 143–146, figs. 2*).—Exposure of yellow, blue, and rose gingham (sold as fast color) and peach, yellow, and green silk crepe (pure dye, not guaranteed color fast) to 25, 50, 75, 100, and 150 hr. of sunlight from 9 a.m. to 4 p.m. in July and August, with averages of 51 percent of relative humidity and 80° F. and to comparable shorter periods in the Fadeometer with averages of 30 percent relative humidity and 120° demonstrated that with these fabrics the Fadeometer is a satisfactory substitute for sunlight for fading tests involving short periods such as 25 or 50 hr. Difference in humidity probably was a factor in causing greater fading by sunlight in the case of longer exposures.

Home dry cleaning solvents, P. B. Mack, P. B. Kessinger, E. I. Ottinger, and M. E. Deck (*Jour. Home Econ., 25 (1933), No. 9, pp. 789–807, figs. 4*).—This paper reports an extensive investigation of 58 home dry cleaning solvents and 10 home spotting agents, the investigation including studies on the composition of the agents, possible fire hazards, cleaning efficiency when used with standard soiled pieces under home conditions as compared with cleaning in representative commercial plants, the effect on representative fabrics and on the hands, possible methods of recovering and using the solvents, and their cost per gallon as compared with the cost of the materials of which they are composed when bought under their own names.

"The cost of doing dry cleaning at home was found to be greater than is commonly supposed, and the cleaning efficiencies of the various solvents proved

to be low. The retail prices of many of the secret preparations were found to be high as compared with the actual cost of their ingredients. It w found that many of the preparations had not been sent to the Underwriter Laboratories or to any other nationally recognized laboratory to be examined for fire hazard, and that even those which had been so examined did not carry on their labels a definite statement as to their degree of fire hazard. The presence of ingredients believed to be toxic even if handled in gallon quantities was revealed in many of the secret trade preparations. These were found in most cases to be accompanied by inadequate directions."

How women select dresses, E. K. Thor and M. L. Cowles (*Jour. Home Econ., 25 (1933), No. 7, pp. 573–576*).—This study of consumer demand was made in a department store where the observer acted as a temporary saleswoman serving 200 customers, of whom 50 purchased a total of 55 dresses. The report summarizes the major factors in the selection of these dresses, and presents practical suggestions for the manufacturer, salesman, and customer.

HOME MANAGEMENT AND EQUIPMENT

The cost of living for 57 industrial families and for 98 farm families in Georgia, E. S. Jones (*Georgia Sta. Bul. 180 (1933), pp. 30*).—Data on the standards of living of industrial families in a cotton mill village were obtained by quarterly interviews during 1931. The same plan was followed in a rural community in 1932 and, in addition, on account of the difference in economic conditions in the two years, data were also obtained from farm families for 1931 by the questionnaire method at the time of the first quarterly survey in 1932. The estimated expenditures and income from all sources other than mill wages were obtained from the mill families and the wages were taken directly from the mill records. Estimated cash expenditures and cash receipts, as well as goods furnished by the farm, were secured from the rural families. Only those records were used in which the balance between income and expenditures, including savings, agreed within 10 percent for the farm families and 15 percent for the mill families. The term family was used to include parents and all children and other relatives supported by the family income, and household the members of the family and any others in the home 6 mo. or more of the year. The members of the household not included in the family but supported from the family income were considered in all costs and other nonfamily members of the household were excluded from all expenditures except food and rent.

Among the data reported the following afford some comparison of the industrial and rural families:

The average size of the 57 mill families studied was 4.3, and of the households 5 persons. The average income was $1,001, with average cash expenditures for savings and investment of $58 and family living $904. The average total cost of living per year was $945, the difference of $41 representing living furnished. The average money value of the food was $378 per household, or 40 percent of the total cost. The other classified average costs were clothing $64, rent $53, furnishings $44, operating costs $114, health $62, advancement $49, personal $55, life and health insurance $85, transportation $37, and unclassified $3.

The average size of the 98 rural families studied was 4 for both 1931 and 1932, and of the households 4.4 and 4.6 persons, respectively. The average income in 1931 was $1,087 and in 1932 $915, with average expenditures of $1,073 and $886, respectively. The average money value of the food was $45[illegible] per household, or about 52 percent of the total expenditures in 1931, and $363

or 51 percent, in 1932. The other classified average costs for 1931 and 1932, respectively, were clothing $47 and $36, housing $23 and $14, furnishings $4 and $6, operating costs $43 and $34, health $45 and $25, advancement $31 and $23, personal $25 and $23, life and health insurance $30 and $26, automobile $15 and $16, and unclassified $2 and $6.

Among both the mill families and the farm families, as the total family expenditures increased the percentage expended for food decreased, and for health, maintenance, and advancement increased. Other items increased or decreased for the various income groups.

When asked their preference for farm or town life, 33 of the mill families expressed a preference for the farm, 19 for the town, and 5 were undecided. Of 31 families who had previously lived on the farm, about one-fourth gave as their reason for leaving the desire to make more money and have more things and another fourth devastation by the boll weevil. All but 8 of the farm families expressed a preference for the farm. "They were not specific in their reasons, but more freedom, pride of ownership, better place to rear children, were some of the reasons suggested as to their personal feeling."

Arkansas farm housing conditions and needs, D. G. Carter (*Arkansas Sta. Bul. 305 (1934), pp. 35*).—This bulletin presents the results of a study of housing conditions and needs conducted in Arkansas in the winter of 1933–34. Data were secured on sample areas in 7 counties, and included about 8.4 percent of the farms of the State and 9.3 percent of the farm population. The study was part of a farm housing survey covering 300 counties in 48 States, conducted by the U.S. Department of Agriculture in cooperation with the State agricultural colleges, and financed by the Civil Works Administration. The 7 counties included in the survey were Arkansas, Drew, Faulkner, Hempstead, Izard, Phillips, and Washington. These counties are representative of the various areas of the State, and as a whole are typical of the entire State.

The proportion of tenants included in the survey was 62 percent compared to 63 percent for the State. The proportion of negro farmers represented in the housing survey was 33.6 percent, compared to 32.6 percent for the State.

The conclusion seems justified that the survey presented an accurate indication of conditions in the entire State, and that averages or percentages may be applied directly to the State as a whole and totals multiplied by 12 for the entire State. The typical average farm home in Arkansas is a 4-room house of frame construction, 1 story high, without basement, with 1 or 2 porches. The average number of regular occupants per house was 4.37 for white owners, 4.80 for white nonowners, 4.58 for negro owners, and 4.84 for negro nonowners. The average number of rooms per house was 4.6 for white owners, 3.9 for white nonowners, 3.8 for negro owners, and 3.7 for negro nonowners. The "rooms per person" for the same groups was, respectively, 1.05, 0.81, 0.84, and 0.76.

Analyses of white-owner houses in Washington County indicated that 72 percent of the families were adequately housed, 11.2 percent had less than the usually needed room, and 16.8 percent were definitely overcrowded. White nonowners were found to be 48 percent adequately housed, 15 percent below usual standards, and 37 percent were overcrowded. Negro groups in 3 counties were indicated as 10 percent adequately housed, 31.4 below standard, and 58.6 percent were severely overcrowded.

Analyses in Washington County showed that the houses on farms above 100 acres in size averaged definitely larger than on farms of smaller acreage. There was a fairly close relationship between size of house and size of farm. There is practically no difference in the average size of rooms (square feet of area) in houses of from 2 to 6 rooms. The superficial area of floor space and

the area of the individual rooms progressively decline from the white owner to the negro nonowner groups. Average house areas ranged from 969 to 666 sq. ft., living rooms from 274 to 203, kitchens from 196 to 141, and bedrooms from 205 to 196 sq. ft.

Despite the smallness of the average house and indications of crowding, the typical occupant did not express a need for more room. Only 18 percent of the occupants indicated a need for additional bedrooms, 20 percent expressed a need for more closet space, and 17 percent wanted storage space for fruit and vegetables. Living rooms, dining rooms, and porches represented the expressed need of from 5 to 7 percent of the families. Need for the addition of kitchens, workrooms, wash rooms, halls, bathrooms, and basement was mentioned by comparatively few occupants.

Analyses of house condition, measured by the several parts of the structure, reflected the lack of care given, especially during the last few years. White-owner homes were definitely in better condition than were the other groups.

Kitchen sinks were the most common item of sanitary equipment found, followed by water pumped or piped into the house, bathtub, lavatory, and flush toilet, in the order named. Less than 10 percent of the white-owner group had any one item of equipment, and less than 3 percent had installations of flush toilet and septic tank. Sanitary facilities were almost completely lacking in the negro houses.

Refrigerators, either ice or mechanical, represented the item of labor-saving or comfort equipment most frequently found, occurring in about 15 percent of the white and 10 percent of the negro homes. Improved cooking equipment was found in about 10 percent of the white-owner homes, and electric or gas lighting in about 10 percent. White nonowners had less than half as much mechanical equipment as the white owners. The negro groups had very little.

The vast majority of desired improvements were repairs to the house structure, as indicated by the families surveyed. In general, the order of need was (1) interior walls, ceilings, and floors; (2) roof; (3) doors, windows, and screens; (4) exterior walls; (5) foundations; and (6) porches. Next to house repair, additional space was most desired. Water supply was the most desired equipment item.

An appendix is included giving data from an engineering analysis of the structural materials, quantities and costs for necessary repairs, additions, and new construction to provide adequate and livable houses.

Arkansas farm house planning, D. G. Carter *(Arkansas Sta. Bul. 306 (1934), pp. 29, figs. 16)*.—This bulletin presents data relating to farm housing needs, conditions, and costs in Arkansas, together with a series of 13 house designs adapted to the needs of the State.

The plans, illustrations, and working drawings were completed in cooperation with the Federal Civil Works Administration.

Household equipment, L. J. Peet and L. E. Sater *(New York: John Wiley & Sons; London: Chapman & Hall, 1934, pp. XI+315, figs. 121)*.—Popular and technical information is given on the subject. Chapters are included on kitchens; materials used in household equipment; fundamentals of electricity; fuels; the electric range; gas; the gas range; coal, gasoline, and kerosene ranges; small equipment, electrical; small equipment, nonelectrical; refrigeration; laundry procedure; electrical cleaning equipment; home lighting; home plumbing; and heating and ventilating.

Electric ranges, H. R. Howe *(U.S. Dept. Agr., Bur. Home Econ., 1934, pp. [1]+12)*.—This mimeographed list of references was compiled to supply those interested in the construction, design, and sale of household electric ranges, with a survey of the English literature on the subject published since 1927.

Electric ranges for household use (*U.S. Dept. Agr., Bur. Home Econ., [1934], pp. 10, figs. 6*).—This presents in mimeographed form a discussion of the results of a survey of literature published since 1927 on electric ranges for household use.

Modern electric and gas refrigeration, A. D. Althouse and C. H. Turnquist (*Chicago: Goodheart-Willcox Co., 1933, pp. [8]+265, figs. 135*).—This is a handbook of technical information on household refrigeration. It contains chapters on fundamentals of refrigeration, the compression cycle, the absorption cycles, refrigerants, conventional compression cycle refrigerators, rotary and hermetic compression cycle refrigerators, the domestic absorption refrigerator, automatic controls, installing and putting refrigerators in service, servicing, electric motors and gas supply, service data, refrigerator boxes and insulation, and technical characteristics.

MISCELLANEOUS

Forty-sixth Annual Report [of Georgia Station], 1933–34, H. P. Stuckey (*Georgia Sta. Rpt. 1933–34, pp. 62, figs. 10*).—The experimental work not previously referred to, covering the 18-month period ended June 30, 1934, is for the most part noted elsewhere in this issue.

Forty-sixth Annual Report [of Texas Station], 1933, A. B. Conner et al. (*Texas Sta. Rpt. 1933, pp. 257*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Report of the Waite Agricultural Research Institute, Glen Osmond, South Australia, 1925–1932 (*Univ. Adelaide, So. Aust., Waite Agr. Res. Inst. Rpt., 1925–32, pp. [2]+149, pl. 1, figs. 28*).—This is the first report, and deals with the establishment (E.S.R., 52, p. 798) and work of the institute. Summaries of papers published by the staff are included, as well as records of field experiments and other data.

New Jersey Agriculture, [May–June 1934] (*N.J. Agr. [New Jersey Stas.], 16 (1934), No. 3, pp. 8*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Improved Seed for New Jersey, by H. B. Sprague (pp. 2, 3), and Jersey Seeds Better, by J. G. Fiske (p. 7).

Annual summary of publications, B. C. Pittman (*Utah Sta. Circ. 105 (1934), pp. 4*).—Abstracts of Bulletins 243–249 and Circulars 102–104 are given, with lists of reprints and leaflets.

NOTES

Illinois Station.—A statement recently issued by the station indicates that the past year has been characterized by increasing demands upon the staff by public agencies and a greater dependence upon the institution for information to serve as a foundation for public programs.

Director H. W. Mumford was made a member of the Board of Directors of the Farm Credit Administration of the St. Louis district and assisted numerous agencies as a member of the organization or in an advisory capacity. These agencies included the Agricultural Adjustment Administration, Illinois State Planning Commission, Illinois Emergency Relief Commission, Civil Works Administration, and others.

Drs. G. L. Jordan, assistant to the director, H. C. M. Case, professor and chief in farm management, and L. J. Norton, assistant professor and assistant chief in agricultural economics, were given leaves of absence to assist the Farm Credit Administration. On September 1 Drs. Case and Norton were appointed, respectively, head of the department of agricultural economics and associate professor and associate chief in agricultural economics.

During the year the U. S. Department of the Interior established a soil erosion project in McLean County, consisting of 140,000 acres. The soil survey of the State, which has been under way for 31 yr., has been found to be invaluable in connection with the location of this erosion project, as well as the location of the Shawnee and Illini National Forest Purchase Units in southern Illinois, game preserves, parks, and Civil Conservation Corps Camps. Maps and other contributions of the soils division were especially useful to the National Forestry Commission, National Research Council, State Planning Commission, State Department of Conservation, Illinois Emergency Relief Commission, the Farm Credit Administration, and other agencies.

Timely information was prepared by the station in connection with emergency crops to offset partially the effects of the drought and the control of the chinch bugs, the infestation of which was very severe in Illinois. Special attention has been devoted to the development of pastures, and the results to date show promise of great value in connection with the development of organized land-use programs.

As a direct result of experimental work, in which the State Natural History Survey cooperated, a new method of codling moth control, consisting of the use of cold-dipped chemically treated bands, was developed. This is now used not only by Illinois orchardists but in orchard sections throughout the country.

Iowa College and Station.—A 200-acre farm, 3 miles south of the college campus and rented by the institution for the past 3 yr., has been purchased by the station for the use of the agricultural engineering section. Here will be continued investigations on crop production carried on in cooperation with the U. S. D. A. Bureau of Agricultural Engineering.

D. B. Demeritt, associate professor of forestry, has resigned to become head of the department of forestry in the University of Maine and has been succeeded by R. B. Thompson of the U. S. D. A. Forest Service. *Science* notes that Dr. J. M. Aikman, associate professor of botany and associate botanist, has been given leave of absence to become senior botanist in the shelter belt tree planting project of the U. S. D. A. Forest Service.

Michigan College and Station.—The resignations are noted of Herman H. Halladay, secretary of the State board of agriculture since 1923 and prominently associated with the business affairs of the institution, and of Dr. Nellie Halliday, research assistant in home economics.

Nevada Station.—Land-use planning in the State began on September 1 with the appointment of George Hardman, chief of the department of irrigation, as consultant for the National Resources Board to work with the State planning board. Preliminary reports on problem areas have been prepared and plans developed for work during the next 6 mo.

Active work on the land classification project for the lands of the Truckee River Valley is under way. Under this project it is proposed to map and classify all irrigated and irrigable lands in the Truckee River area from Pyramid Lake to the Nevada-California State line. Additional studies on the water supply for these lands will be made at a later date.

New York State Station.—The station has resumed studies begun 3 yr. ago of fruits and vegetables suitable for preserving by quick freezing. The work is being carried on under a cooperative arrangement between the station and a commercial corporation of New York City. The marketing of fruits and vegetables in a frozen state is believed to hold considerable promise as a new outlet for New York State products.

The work of the past season has centered on the freezing of strawberries, raspberries, cherries, peas, and corn on the cob. During the autumn and winter fundamental work on the freezing of fruits, particularly strawberries and raspberries, will be undertaken. This work will involve a consideration of the changes in pectin and protein during freezing, and will be carried on jointly by chemists of the station and the corporation.

Dr. P. A. Hansen, assistant in research (bacteriology), has resigned effective October 15 to become instructor and investigator in the Royal Polytechnical Institute in Köbenhavn (Copenhagen), Denmark.

Oklahoma College and Station.—The agronomy department of the station has completed a seed house costing approximately $10,000 and which is expected to be of great service in handling seed research on crops.

B. F. Kiltz, associate professor of agronomy, and H. H. Finnell, associate agronomist at Goodwell, have been granted a year's leave of absence, the former to take charge of the soil erosion nursery and grass studies for the Southwest and the latter to direct the wind erosion project in that area. Dr. P. H. Stephens, professor of farm management, has resigned to become statistician for the Federal Land Bank at Wichita, Kans.

Pennsylvania College.—Harry G. Parkinson, head of the department of agricultural education, has been appointed acting dean of the College of Agriculture of the University of Puerto Rico, vice Dr. Frank D. Kern, who has returned to Pennsylvania as head of the college department of botany and dean of the Graduate School.

South Dakota College and Station.—Recent appointments include Dr. T. Hillard Cox as assistant professor of agricultural economics and assistant agricultural economist and Jeanette Ross as research chemist in home economics vice Florence V. Barr, resigned. Daniel H. Jacobsen, instructor in dairy husbandry, and W. C. Tully, instructor in poultry husbandry, have been granted a year's leave of absence to complete work on their master's degrees at the Iowa College.

Tennessee Station.—A soil survey of Jefferson County has been begun in cooperation with the U. S. D. A. Bureau of Chemistry and Soils. This survey will be supplemented by a detailed crop survey by the station and Dr. J. C. McAmis of the Tennessee Valley Authority. These surveys will be used by

the Authority in planning land use in agriculture in connection with its general program of development. The crop survey will report the present use of the land and the yields under present methods, and will also include estimates on what the land could yield if it were planted to other crops and managed according to the methods that have proved most profitable and practical in using other soils of the same type in that vicinity. The reports will also include results of practical experience in applying fertilizers to the various soils.

Virginia Station.—Recent appointments include S. K. Cassell and W. L. Gibson, assistant agricultural economists; Frances V. Hicks, assistant in household engineering; B. V. Conner, technician in animal pathology; and E. M. Matthews, superintendent of the Pittsylvania County Substation vice T. L. Copley, resigned.

West Virginia University and Station.—During the past season the station has furnished technical supervision for a series of experiments undertaken at the Federal Government's first subsistence homestead project located at Arthurdale, Preston County. Thirty acres set aside for experimental purposes have been put in condition, and plantings have been made of black and red raspberries, strawberries, and hybrid blueberries under the direction of the department of horticulture. The project is financed through a grant made by the Subsistence Homestead Division of the U. S. Department of the Interior, and labor is furnished by homesteaders on the project. The aim of the trials is to ascertain the practicability of introducing small fruit growing into the higher altitudes of the State, thereby prolonging the season of home-grown fruits.

James V. Hopkins, for 11 yr. extension dairy specialist, died at Huntington July 2 at the age of 40 yr. He was a graduate of the University of Tennessee in 1917 and received the M. S. degree from the University of West Virginia in 1930. He had also been instructor in Maryville College from 1917 to 1922.

Necrology.—In the words of a recent tribute in *Science* by Dr. W. A. Taylor, "in the death of Dr. Karl Frederic Kellerman . . . in Washington, D. C., on August 30, 1934, agricultural science lost a very productive investigator in the biological field and an unusually able administrator of a wide range of research, regulatory, and service projects." Dr. Kellerman was born in Göttingen, Germany, on December 9, 1879, but spent most of his boyhood in Manhattan, Kans., and Columbus, Ohio, where his father held professorships in botany in the Kansas College and the Ohio State University. He was graduated from Cornell University in 1900, and received the honorary D. Sc. degree from the Kansas College in 1923 in recognition of his work in plant physiology and pathology.

Aside from a year at Cornell, his work had been entirely in the U. S. Department of Agriculture. The first 15 yr. were spent largely in research in water supply purification and soil bacteriology. In 1914 he became Assistant Chief of the Bureau of Plant Industry and in 1917 Associate Chief, continuing in this capacity until transferred in 1934 to what is now the Bureau of Entomology and Plant Quarantine.

His special services included membership for 10 yr. in the Federal Horticultural Board and since 1917 in the National Research Council and his organization for the Department of campaigns against citrus canker, phony peach, and Dutch elm disease. He had a large part in the establishment and formulation of policies of the *Journal of Agricultural Research*, serving from 1913 to 1924 as the first chairman of its editorial board.

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